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A
SYLLABUS
OF
A COURSE OF
CHEMICAL LECTURES
READ AT
GUY's HOSPITAL.

BY

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AND

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PREFACE.

IN every Science taught by Lectures, a Syllabus of the Courſe has been found of advantage to the Student. At the ſame time that it lays before him a comprehenſive outline of the ſubject, and points out the ſeveral diviſions and their arrangement with reſpect to each other,—it defines the meaning and extent of ſcientific terms, by ſhewing him their appropriate application and uſe, and thus inſtructs him in the language while he is acquiring the rudiments of the ſcience.

As the objects of Chemiſtry are various, and its views extenſive, ſo likewiſe is the connection of its principles ſubtle, and their inveſtigation complicated and minute: hence the aid of ſuch a ſynopſis is perhaps even more requiſite in this than in any other branch of Natural Philoſophy. In proportion too as modern improvements have enlarged the ſcope, they have increaſed the utility of a Proſpectus to explain it; and upon taking a retroſpect of the laſt five and twenty years it will appear, that the diſcoveries within that period are ſo numerous and important,—the change which the Nomenclature has lately undergone is ſo eſſential and entire, that the Chemiſtry of the preſent day, compared with that of former times, may not improperly be conſidered as a new ſcience expreſſed in a new language.

On theſe grounds it has been thought right to draw up the following Syllabus of the Lectures delivered at this Hoſpital.

As the Courſe is neceſſarily deſigned for Medical Students, particular attention has been beſtowed on thoſe parts which relate to their profeſſion. It is not, however, confined to this object alone. Chemiſtry is now ſo intimately connected with various departments of Science, and with moſt of the Arts and Manufactures whether uſeful or ornamental, that an acquaintance with it has become in ſome degree neceſſary in the general ſyſtem of education; and however different the views with which the Gentleman, the Artiſt, and the Manufacturer may enter upon its ſtudy, each will obtain information adapted to the particular line of his purſuit, that will amply reward him for the time he may ſpend in acquiring a competent knowledge of its principles.

Agreeably to this view of the matter, an endeavour has been made to point out the application of theſe principles, not only to the purpoſes of Medicine, but to moſt others to which Chemiſtry is in any way allied; and it is hoped that, independently of advantage during the period of teaching, this Syllabus may be uſeful to Students when they have ceaſed to attend;—that by future peruſals they may not only recal ſuch information as length of time or diverſity of employment had eraſed from their memories,—but that it may alſo ſerve as a general outline of the ſcience, to be filled up at their leiſure,—as a ſyſtematic arrangement to which they may refer whatever knowledge they ſhall hereafter obtain.

Although the ſyſtems of the older Chemiſts are now exploded, and many of their principles ſhewn to be fallacious, their works are ſtill acknowledged to contain many valuable facts and obſervations. But the ancient Nomenclature differs ſo widely from the modern, that the Student of the preſent day often finds the meaning of theſe authors involved in conſiderable obſcurity. To obviate this difficulty as much as poſſible for the learner, tables are ſubjoined drawn up after the manner of thoſe propoſed by *M. M. Morveau*, *Lavoiſier*, *&c.* in which the old and new names of chemical ſubſtances are ſo claſſed, as to be brought under the eye, and compared at one view; and as ſome pains have been taken to render theſe tables at once copious and correct, it is hoped they will on moſt occaſions be found to anſwer fully their intended purpoſe.

As it is not diſcoverable from this Syllabus, which treats only of the chemical part, it may be proper to mention, that the Courſe to which it refers, is rendered additionally illuſtrative of General Science, by introducing occaſionally, and in their proper places, ſuch parts of Experimental Philoſophy as it is more immediately connected with. — By the free acceſs, likewiſe, to an extenſive Laboratory, the Student has an opportunity of ſeeing the various chemical proceſſes conducted upon a ſcale correſponding with the expenditure of a large Hoſpital, and thereby of becoming familiarly acquainted with every ſtep neceſſary in the management of ſuch operations; — without which the demonſtrations of a Lecture-room will ſeldom acquire that force which is neceſſary to fix them in his memory, and enable him to apply them with readineſs and effect upon any future and diſtant occaſion.

A

SYLLABUS OF CHEMISTRY.

INTRODUCTION.

OF the properties of *Matter*, the ſubject of experimental philoſophy in general.

Theſe either common to all bodies, as *Extenſion*, *Impenetrability*, *Diviſibility*, *Weight;* or proper to particular bodies, as *Colour*, *Figure*, *Texture*, *Solubility*, &c.

From the conſideration of the peculiar properties of *Matter* ariſes its diſtribution into different *Kinds;* and from the action of *theſe* upon each other, the various *Combinations* and *Decompoſitions*, the ſtudy of which conſtitutes the province of CHEMISTRY.

CHEMISTRY therefore defined, *The Science of the Compoſition and Decompoſition of the heterogeneous particles of Matter:* or " that which teaches the intimate and reciprocal action of bodies upon each other."

Of the diſtinction and connexion between this, and other branches of natural knowledge, more eſpecially *Natural Hiſtory*, and *Natural* or *Experimental Philoſophy*.

What is generally underſtood by the *Vis Inertiæ* of matter.

Of the *Motion* of bodies, as communicated to them by *external Impulſe*, or excited in them by their diſpoſition to *attract*, or *repel* each other.

Of the different ſpecies of *Attraction* which originate from this diſpoſition, viz. of *Magnetiſm* — of *Electricity* — *Capillary Attraction* — *Attraction of Gravitation* — *Attraction of Aggregation* or *Coheſion*, and *Chemical Attraction*.

OF THE ATTRACTION OF GRAVITATION.

This affords the means of eſtimating the *Specific Gravity* of Bodies.

Every particle of matter equally acted on by *Gravity*.

Abſolute Gravity, the force with which all bodies are attracted to the centre of the earth; thoſe which contain the greateſt number of particles under a given ſurface conſequently heavieſt.

Specific Gravity, a compariſon of theſe forces or of the *Weight* of bodies with their *Bulk*, or with an equal bulk of another body.

Water generally aſſumed as a ſtandard and eſtimated at 1 or unity.

Bodies heavier than water, ſaid to be of greater ſpecific gravity, thoſe that are lighter of leſs ſpecific gravity.

OF THE ATTRACTION OF AGGREGATION.

The *homogeneous* particles of bodies united by this Attraction with different degrees of force: hence *Hardneſs*, *Softneſs*, *Fluidity*, ſtate of *Vapour*, and of *Air* or *Gas*.

Alſo affected by it in different modes: hence *Brittleneſs*, *Ductility* and *Malleability*; hence alſo *Texture*, and *External Figure*.

Cryſtalliſation moſt regular when the particles of a body are moſt at liberty to act on each other, as on ſlow evaporation after previous ſolution; alſo the more homogeneous the particles the more regular their arrangement.

Inſtances comparatively few of bodies different in their kind aſſuming ſimilar forms, or of the ſame body aſſuming different forms: hence the importance of *Cryſtallography* and uſe of the *Goniometer.*

Diſtinction between *primative*, and *derivative* or *ſecondary* cryſtals—Theory of *Abbé Háuy*—Numerous examples of *Cryſtalliſation* in the concrete *ſaline Bodies*, from their ready ſolubility in water and the facility with which this may be ſeparated—many alſo in the *earthy* and *metallic Bodies* and in ſome of the *combuſtible*, as in *Sulphur.*

OF CHEMICAL ATTRACTION.

This a principal agent in all chemical operations and phenomena. It differs from the foregoing, in acting excluſively between the particles of ſuch bodies as are *diſſimilar*, or *heterogeneous.*

It takes place amongſt the *more minute Particles* of bodies, and at *inſenſible Diſtances.*

It requires that theſe ſhould poſſeſs a certain degree of *Fluidity.*

It produces in their properties very remarkable changes, of *Temperature*, *Specific Gravity*, *Texture*, *Colour*, *Taſte*, *Smell*, &c. ſo that the properties of the compound can ſeldom be deduced from thoſe of its component parts.

This attraction exerts itſelf between different bodies more or leſs powerfully:—hence the important doctrine of *Chemical Affinity*, and the conſtruction of tables of *Simple* and *Compound Affinity*, called alſo tables of *Single* and *Double Elective Attraction.*

Of *Saturation*, or the limitation to the proportions in which certain bodies *chemically* unite.

Of the means by which the agency of *Chemical Attraction* may be increaſed or diminiſhed, and its influence in effecting the decompoſition of bodies and reſolving them into their conſtituent parts or elements.

The *Simple Subſtances* thus obtained, and of which all the others hitherto examined appear to be compoſed, are *Light*, *Caloric*, the *Electrical* and *Galvanic Fluids*, *Oxygen*, *Hydrogen*, *Nitrogen* or *Azote*, the fixed *Alkalies*, *Earths*, *Metals*, *Carbon*, *Sulphur* and *Phoſphorus*.

OF CALORIC.

How the terms *Caloric*, *Matter of Heat*, *Fire*, *Temperature*, &c. are philoſophically to be underſtood.

Of the various opinions which have been entertained with regard to the nature of *Caloric*.

In what reſpects it differs in its general properties from, or is analogous to, *Light*, *Electricity*, and *Galvaniſm*.

Juſtly conſidered as a fluid of univerſal agency.

It exiſts either in a *looſe* ſtate, producing in different bodies, *Warmth*, *Expanſion*, *Fluidity*, *Volatility*, &c. in proportion to its quantity; or in a ſtate of *Combination*, in which its properties ceaſe to be evident; in the one caſe called *ſenſible*, in the other *latent*.

Caloric in a *ſenſible* or *looſe* ſtate has a tendency to diffuſe itſelf among contiguous ſubſtances, ſo as to maintain in them an uniformity of temperature.

It paſſes from one body to another with more or leſs celerity according to its intenſity. *Denſe* bodies alſo tranſmit it more readily than *rare*: hence the diſtinction between more and leſs perfect *Conductors* of *Caloric.*

In *fluid* bodies it keeps up a perpetual circulation of their particles.

It appears to have for different bodies different degrees of *Elective Attraction.*

Equal quantities of *Caloric* produce unequal temperatures in equal quantities of diſſimilar ſubſtances. Bodies therefore ſaid to have different *Capacities* for *Caloric*, or to differ in their *ſpecific* or *comparative Heats.*

The *ſpecific Caloric* of bodies beſt meaſured by the quantity of ice or ſnow which they are found capable of melting.

The capacity of bodies for *Caloric* varies according to their ſtate of aggregation.

The *Caloric* which a body gives out in paſſing from one ſtate of aggregation to another, it will again abſorb in reſuming its original ſtate, and *vice verſâ.*

A variation in the *Temperature* of bodies univerſally accompanied by a variation in their *bulk*.

In ſome the dilatations and contractions are found to correſpond with the increaſe or diminution of *Caloric* by which they are occaſioned: hence the conſtruction of the *Thermometer*.

Of the precautions to be obſerved in the application of this uſeful inſtrument.

Of the *Liquefaction*, *Melting*, or *Fuſion* of bodies.

Of their *Volatilization*, or converſion into vapour by *Caloric*.

Increaſe of *Caloric*, by leſſening the attraction of aggregation, ſometimes diminiſhes and ſometimes augments the diſpoſition to union between different bodies.

The effects of *Cold*, or diminution of caloric, in many inſtances equally remarkable.

Bodies in a ſtate of vapour poſſeſs a high degree of *Elaſticity:* hence the effects of the *Steam Engine*, as depending on the expanſive power of volatilized water.

To the head of *Evaporation* may alſo be referred the proceſſes of *Diſtillation*, and *Sublimation.*

Bodies heated to a certain degree may be thereby either rendered *luminous* without ſuffering any other eſſential change; or, if in contact with air, may undergo an entire alteration in their properties: in the one caſe they are ſaid to be *ignited;* in the other, *burned* or *inflamed.*

The phenomena and effects of *Combuſtion* therefore referred to the head of *Oxygen.*

OF AERIFORM SUBSTANCES OR GASSES.

Theſe conſiſt of a ſolid ponderable ſubſtance or *Baſe* combined in a peculiar manner with *Caloric.*

The property of the reſulting gas depends upon the nature of its *Baſe.*

Thoſe not condenſable at common temperatures, diſtinguiſhed by the name of *Permanently elaſtic Fluids.*

Method of aſcertaining the *abſolute* and *ſpecific Gravity* of gaſſes, and computing their volume under different circumſtances of *Preſſure* and *Rarefaction*.

Elaſticity of the air.—Theory of the *Air-Pump*.

Of Oxygen Gas.

Called formerly *Dephlogiſticated*, *Pure*, *Empyreal*, or *Vital Air*.

One of the moſt important diſcoveries of modern Chemiſtry.

Forms a conſtituent part of the *atmoſphere*.

Obtained moſt readily from *Metallic Oxyds*, and compounds of the *Nitric* and other acids, by the application of heat.

Its purity beſt aſcertained by expoſure to a ſolution of *green Sulphate* or *Muriate of Iron* ſaturated with *Nitrous Gas*, or by mixture with the Gas itſelf: *Eudiometer*.

Somewhat heavier than *Common Air*.—100 cubical inches at the temp. of 60 *Farenh.* and at 30 inches *Bar. preſs.* weigh about 34, 5 grains.

Is abſorbed by many bodies upon ſimple expoſure, and thereby often produces in them a change both of colour and conſiſtence.

Serves the purpoſes of *Reſpiration* and *Combuſtion* in an eminent degree.

In Reſpiration is diminiſhed in bulk in proportion to its purity, and by uniting with *Carbon* produces *Carbonic Acid Gas:* hence the ſuppoſed function of the *Lungs*, and origin of *Animal Heat.*

In *Combuſtion* it varies in its effects according to the nature of the *Combuſtible Subſtance*, and the manner in which it is employed.

It deſtroys the ſplendour and tenacity of the *Metallic Bodies* when they are expoſed to it at a high temperature, and gives them an encreaſe of weight proportioned to its own conſumption: hence the modern theory of *Calcination.*

To *Sulphur*, *Phoſphorus*, and *Charcoal*, in the act of burning, it communicates *acid* properties; which are more or leſs diſtinct as the combuſtion or decompoſition of the Gas has been more or leſs complete.

The baſis, therefore, of this fluid conſidered as the univerſally *Acidifying Principle*, and hence denominated *Oxygen:*—hence alſo the terms *Oxyd*, *Oxydation*, *Oxygenation*, &c.

By combuſtion with *Hydrogen Gas* (ſo named from this property) it forms *Water*, together with a portion of *Nitric Acid*, if the combuſtion be rapid.

Of Azote or Nitrogen Gas.

Called formerly *Phlogiſticated Air*, and *Mofete.*

Has never yet been found uncombined.

Remains after the abſtraction of *Oxygen Gas* from *Atmoſpherical Air*, by expoſure of the latter to *Sulphuret of Potaſh*, to a mixture of *Iron Filings* and *Sulphur*, &c.

Obtained alſo by mixing *Oxymuriatic Acid* with *Ammoniacal Gas.*

When pure has a faint ſmell, but no taſte, and is rather lighter than *Atmoſpherical Air.*

100 cubical inches, *Therm.* 60° *Bar.* 30° weigh about 30, 4 grs.

If inſpired is inſtantaneouſly deſtructive of *Animal Life*, and extinguiſhes *Flame;* but does not impede *Vegetation.*

Differs from moſt other *Gaſſes* in being but in a ſmall degree capable of abſorption by *Water*, or by the liquid forms either of *Acids* or *Alkalies.*

Evolved in the decompoſition of *Animal* and *Vegetable Subſtances*, of which it forms a conſtituent part.

When mixed in a certain proportion with *Oxygen Gas* and expoſed to the *Electrical Spark*, it produces *Nitric Acid;* and by union with *Hydrogen Gas* it forms *Ammonia*—from the former of theſe properties it takes the name of *Nitrogen.*

Of the means thought to be employed by nature to maintain a due proportion between this and *Oxygen Gas* in the compoſition of the *Atmoſphere*.

Of Hydrogen Gas, or Inflammable Air.

Found in a diſengaged and impure ſtate in *Coal Mines*, on the ſurface of *Stagnant Waters*, and riſing through the waters of certain *Springs.*

Obtained alſo artificially from *animal, vegetable*, and *bituminous* matter by diſtillation; from *Eſſential Oils, Alcohol, Æthers*, &c. by the application of heat; and from *Ammoniacal Gas* by means of the *Electric Spark.*

But pureſt from the decompoſition of *Water* by *Metals*, as above ſtated; or during their ſolution in *diluted Acids*.

When pure, between 11 and 12 times lighter than *Atmoſpherical Air*: hence the conſtruction of *Aëroſtatic Machines*.

Smell adventitious.

100 cubical inches at a Temp: 60 *Farenht.* and 30 inches *Bar. preſs.* weigh 2. 8 grs.

Combined with *Oxygen* in the proportion of about 15 *Hydrogen* to 85 *Oxygen* by weight, it forms water, from the decompoſition of which theſe fluids may be both obtained in a gaſeous ſtate, and therefore conſidered as its elements.

Hence the effects of *Water* in promoting *Combuſtion*, in the *Oxydation* of *Metals*, in furniſhing *Oxygen Gas* from vegetables under the influence of *Light*, &c. &c.

In the combuſtion of *Hydrogen* with *Oxygen Gas*, the purity of the reſulting water depends on the ſlowneſs or rapidity with which the proceſs is conducted.

On inſpiration proves noxious to *Animal Life*, apparently by the excluſion of the *reſpirable* part of the *Atmoſphere*.

Sulphurated, and *Phoſphorated Hydrogen Gas* are varieties of *Common Hydrogen Gas*, in which the bodies from whence they are denominated are held by it in ſolution.

In its naſcent ſtate it is found to be capable of combining both with *Oxygen* and *Azote;* with the one producing *Water*, as in the caſe of combuſtion; and with the other, *Ammoniac*.

Hydrogen and *Nitrogen Gaſſes* by their union compoſe *Ammoniac*.

Of Nitrous Oxyd Gas.

Procured from the decompoſition of *Nitrate of Ammonia* with a gentle heat. Conſiſts of *Oxygen* and *Azote* in intimate union. In ſome of its properties reſembles *Acids*.

100 cubical inches at a middle temperature and preſſure, weigh about 50 grains—Is decompoſed by combuſtible ſubſtances at a very high temperature—Soluble in double its volume of *Water*, to which it communicates a ſweetiſh taſte.

Remarkable for the intoxicating effects which it produces in reſpiration.

Gaſeous Oxyd of Carbon.

Procured by expoſing the *Oxyds* of *Metals* and *Charcoal*, or a mixture of powdered *Marble* and filings of *Zinc* to a red heat.

Till lately conſidered as *Hydrogen Gas* holding *Carbon* in ſolution, and called by *Prieſtly Heavy Inflammable Air*, but proved by *Cruickſhank* to be a diſtinct ſpecies, having *Carbon* for its baſis combined with a limited proportion of *Oxygen*, inferior to that which conſtitutes *Carbonic Acid.*—100 cubical inches, middle temperature and preſſure, weigh about 20 grs.—It is inflammable, and burns with a lambent blue flame, but does not explode with common air. And by combuſtion is almoſt wholly converted into *Carbonic Acid.*

The *Ammoniacal* and *Acid Gaſſes* referred to the claſs of *Salts.*

Method of aſcertaining the preſence of particular gaſſes and of ſeparating them from each other.

OF SALTS.

Theſe characterized by being *ſapid* or of a *ſaline taſte* and readily *ſoluble* in water; further remarkable for their diſpoſition to act on, or to be acted upon by moſt other ſubſtances, as alſo for the regularity of the forms which they are in moſt inſtances found capable of aſſuming—*Cryſtalliſation.*

Their ſolution in water for the moſt part accompanied by a diminution of temperature: hence the uſual means of producing *artificial Cold.*

On expoſure to air generally either receive or impart moiſture: hence ſaid to be *deliqueſcent* or *efflореſcent.*

When heated, the greater number undergo either *watery* or *igneous Fuſion*—ſome are volatalized, and many more or leſs completely decompoſed.

They are divided into *ſimple* and *compounded*—the more ſimple are, *Alkalies* and *Acids*—the compounded, ſuch as reſult from the union of theſe with each other, *Neutral Salts,*—or of the acids with earths and metallic oxyds, *Earthy* and *Metallic Salts.*

OF ALKALIES.

Diſtinguiſhed by being of a pungent, and lixivial or urinous *Taſte*, and by changing moſt vegetable *blue* colours to *green*, and many of the vegetable *yellow* colours to *brown*.

Have a ſtrong attraction for *moiſture*.

Produce no alteration on each other, but manifeſt an extenſive diſpoſition to unite with other bodies. With *Acids* they conſtitute *Neutral Salts*.

They precipitate from their ſolutions moſt of the *Earths*, and all the *Metallic Oxyds*, ſeveral of which they are capable of re-diſſolving.

With *unctuous ſubſtances* they form *Soaps;* with *Silex* and *Alumine* various kinds of *Glaſs* and *Porcelain;* with *Sulphur*, *Alkaline Hepars* or *Sulphurets*.

The ſubſtances moſt perfectly *Alkaline* are *Potaſh*, *Soda*, and *Ammonia;* the two former ſtill conſidered as ſimple bodies, the latter remarkable for its volatility in a moderate temperature, and now known to be a compound of *Hydrogen and Azote*.

Many of the *Earths* alſo have diſtinct alkaline properties, more eſpecially *Baryt*, *Strontian* and *Lime*.

Of Potaſh.

Appears to be a conſtituent part of moſt *vegetable* ſubſtances; it is alſo found to enter into the compoſition of ſeveral *minerals*. Uſually obtained from the aſhes of the former in the ſtate of *common Potaſh*, by elixation in water and evaporation to dryneſs; or in that of *pure Potaſh* by ſubſequent treatment with *Lime*.

Form, *concrete*. Taſte, *extremely pungent*. *Cauſtic*. Colour, *white*.

Has a ſtrong attraction for *moiſture*.

On ſolution in *Water* produces an increaſe of temperature (*Aqua Kali puri* P. L.)

Combines with all the *Acids*, and in moſt inſtances with a force of attraction ſuperior to that of any other ſubſtance.

Fuſible in a moderate, and volatile in an intenſe *Heat*.

Promotes the fuſion of *earthy Bodies* and of *metallic Oxyds ;* hence the preparation of different kinds of *Glaſs.* Unites with *Sulphur*, and renders it ſoluble in water (*Kali Sulphuratum* P. L.)

The order of attraction of this alkali, in the moiſt way, *Sulphuric*, *Nitric*, *Muriatic*, *Sebacic*, *Fluoric*, *Phoſphoric*, *Oxalic*, *Tartareous*, *Arſenic*, *Succinic*, *Citric*, *Formic*, *Lactic*, *Benzoic*, *Acetic*, *Saccho-lactic*, *Boracic*, *Sulphureous*, *Nitrous*, *Carbonic*, *and Pruſſic Acid ; Water*, *Unctuous Oils*, *Sulphur*, *Metallic Oxyds ;* in the dry way, *Phoſphoric*, *Boracic*, *Arſenic*, *Sulphuric*, *Nitric*, *Muriatic*, *Sebacic*, *Fluoric*, *Succinic*, *Formic*, *Lactic*, *Benzoic*, and *Acetic Acid*, *Baryt*, *Lime*, *Magneſia*, *Alumine*, *Silex*, *Sulphur.*

Sometimes preſcribe internally in ſolution; in the concrete form frequently employed as a *Cauſtic.*

Of Soda.

Found in great abundance in the mineral kingdom, particularly in combination with

Muriatic Acid.—Obtained, in a pure or cauſtic form, from *Carbonate* of *Soda*, by means of *Lime*, as pure or cauſtic *Potaſh* is from *Carbonate of Potaſh.*

Its *Form*, *Colour*, *Taſte*, *Cauſticity*, &c. nearly the ſame with thoſe of the former *Alkali.*

Has an equally extenſive diſpoſition to combine with *Acids.*

Acts powerfully on the *Earths*, and *metallic Oxyds;* alſo unites readily with *unctuous Subſtances*, — hence the preparation of *common Soaps.*

Order of Attraction of this Alkali, the ſame as that of *Potaſh.*

Of Ammonia.

Obtained from the diſtillation of *Bones* and other kinds of *animal Matter*, but pureſt from the decompoſition of *Muriate of Ammonia*, by *Potaſh*, *Soda*, or *Lime.*

Form *gaſeous.*—Smell extremely *pungent.*—*Cauſtic.* — *Azotic.* — Lighter than *Atmoſpheric Air*, in the proportion of 180 to 1000.

Is abſorbed both by *Water* and *Spirit;* by the former with great rapidity, producing an increaſe of temperature and bulk (*Aqua Ammoniæ puræ* P. L.) On the contrary, *Ice* diſſolved in this fluid, produces cold.

Is in a ſlight degree *inflammable.*

May be decompoſed in various ways; as by expoſure to *Heat*, by the *Electric Spark*, in the reduction of *Metallic Oxyds*, by the diſtillation of *Nitrate* of *Ammonia*, &c. yielding in ſome caſes *Hydrogen*, in others *Azotic Gas:* which gaſſes by particular modes of combination have been found to reproduce it, and are therefore conſidered as its elements.

Agrees nearly with the other *Alkalies* in the order of its attraction, both in the humid and dry way.

OF ACIDS.

Appear in general to conſiſt of *Combuſtible Subſtances* in union with the baſe of *Oxygen Gas*, the proportion of which in moſt caſes determines the degree of *Acidity.*—Several of them the immediate reſult of *Combuſtion.*

Diſtinguiſhed by being *ſour* to the taſte, changing vegetable *blue* colours to *red*, and by their extenſive power of combining with other ſubſtances.

The properties of the individual *Acids* dependent on the nature of their reſpective *Baſes:* the ſtronger the attraction of their Baſes for *Oxygen*, the leſs intenſe in moſt inſtances their *Acidity.*

All unite readily with water. *Diluted Acids.*

In combination with *Alkalies* form for the moſt part what are called *Neutral Salts;* with *Earths* and *Metallic Oxyds*, *Earthy* and *Metallic Salts.*

Moſt of the acids *antiſeptic.* Some powerfully *corroſive.*

Admit of different diſtinctions—from their form, into *ſolid*, *liquid*, and *gaſeous;* from their more uſual and abundant ſources, into *mineral*, *vegetable*, and *animal;* into ſuch as have *ſimple* and ſuch as have *compounded* baſes.

The more important of the *Acids* are, the *Sulphuric*, *Nitric*, *Muriatic*, *Carbonic*, *Fluoric*, *Boracic*, *Acetous*, *Tartareous*, *Oxalic*, *Gallic*, *Phoſphoric* and *Pruſſic.*

Of Sulphuric Acid.

Formerly called *Acid*, *Oil*, and *Spirit of Vitriol.*

Long conſidered as the *Univerſal Acid.*

Seldom found uncombined.

Obtained artificially from the rapid combuſtion of *Sulphur*, or of a mixture of *Sulphur* with *Nitre*, or from the diſtillation of *Sulphate* of *Iron.*

Concentrated afterwards by *boiling.*

When pure, *limpid*, *ponderous*, *unctuous*, *inodorous*, and intenſely *ſour.*

Specific gravity nearly double that of *Water.*

Has a powerful attraction for *Moiſture*, and on mixture with *Water*, occaſions a remarkable increaſe of temperature.

When volatilized by the higher degrees of heat, it aſſumes the form of a denſe white vapour, the firſt portions of which ſometimes congeal if expoſed to a moderate cold. (*Glacial Oil or Acid of Vitriol.*)

Combined with *Alkalies* it forms.

1ſt. *Sulphate of Potaſh* (*Kali vitriolatum* P. L.) uſually prepared from the ſaline maſs which remains after the diſtillation of *Nitric Acid.*—

Form, *cryſtalline.*—Taſte, *ſaltiſh bitter.*—Difficultly ſoluble in water; alſo very difficult of fuſion —May be decompoſed either in the *moiſt* way by *Baryt*, or in the *dry* way by calcination with *Charcoal.*—100 parts conſiſt of 40 of *Sulphuric Acid*, 52 of *Potaſh*, and 8 of *Water.*—Application chiefly *medical.*

2d. *Sulphate of Soda* (*Natron Vitriolatum* P. L.) obtained by ſolution and cryſtalliſation from the matter left behind in the preparation of *Muriatic Acid*, *Muriate of Ammonia*, or *Muriate of Quickſilver.* Form of its cryſtals, *priſmatic.*—Taſte, *bitter.*—Effloreſces on expoſure to *Air.*—Readily ſoluble in *Water.*—When expoſed to *Heat*, undergoes watery fuſion. May be decompoſed in the ſame way as *Sulphate* of *Potaſh.*—Uſed only in *Medicine.*

3d. *Sulphate of Ammonia;* obtained by the union of *Sulphuric Acid* with *Ammonia*, on the addition of diluted *Sulphuric Acid* to liquid *Carbonate of Ammonia.*—Form, *cryſtalline.*—Taſte, *bitter*, *pungent.*—Eaſily ſoluble in *Water.* *Fuſible. Volatile.*—Employed principally in the manufacture of *Muriate* of *Ammonia.*

Forms alſo with the *Earths* and *Metallic*

Oxyds particular compounds, to be hereafter ſpoken of under their reſpective heads.

By treatment with *Combuſtible Subſtances* is generally more or leſs diſcoloured, and may be either deprived of a portion of its *Oxygen* and thereby made to aſſume the form of *Gas*, or totally decompoſed and reduced to its original baſis, *Sulphur*.

The properties of *Sulphureous Acid Gas*, which may be alſo prepared by the *ſlow* combuſtion of *Sulphur*, in many reſpects different from thoſe of the *common Acid;* its compounds therefore differently denominated. *Sulphate of Potaſh*, &c.

The *Sulphuric* ſuperior to moſt *Acids* in its *Power* of *Attraction* for other bodies.

Independently of its *Water*, ſuppoſed to conſiſt of 61.5 parts of *Sulphur* and 38.5 of *Oxygen.*

The order of its attraction *Baryt*, *Potaſh*, *Soda*, *Lime*, *Magneſia*, *Ammonia*, *Alumine*, *Metallic Oxyds*, *Water*, *Spirit.*

Employed principally in *Dying*, *Bleaching*, *Tanning*, *Purification* of *Oils*, and in *Medicine*.

Of Nitric Acid.

Obtained from the decompoſition of *Nitrate* of *Potaſh* by *Sulphuric Acid*, or by de-aqueated *Sulphate* of *Iron*.

Purified by re-diſtilling it from a freſh portion of *Nitre*, or by the addition of *Nitrate* of *Silver* and of *Baryt*.

In its common form, of a *yellowiſh* or *orange* colour: when pure, altogether *colourleſs* : *ſpecific gravity* 1. 500.

More *volatile* and leſs *ponderous* than *Sulphuric Acid*—its *Acidity* equally intenſe—attracts *Moiſture* alſo from the atmoſphere, and unites readily with *Water* ; but produces with it a leſs degree of *Heat* : (*Acidum Nitroſum dilutum* P. L.) *Aqua-fortis*.

Deſtructive, more immediately than the *Sulphuric Acid*, of the life and texture of bodies to which it is applied.

On mixture with *that Acid* communicates to it the property of diſſolving ſilver : *Aqua Reginæ*.

Combined with Alkalies it forms,

1ſt. *Nitrate of Potaſh* (*Kali Nitratum* P. L.);

obtained in the Eaſt Indies and other countries, by the elixation of certain ſoils, in which it is either ſpontaneouſly and repeatedly produced by their expoſure to Air and Light, or formed upon the addition of *Potaſh*.—Thoſe ſoils more eſpecially productive which abound in vegetable and animal matter that has run into a ſtate of putrefaction.—Freed from extraneous ſaline matter by repeated cryſtalliſation.—Form of its cryſtals *priſmatic*.—Taſte, *cold*, *ſaline*, *penetrating*.—Much more ſoluble in hot than in cold water.—In a moderate heat undergoes watery fuſion (*Salprunelle*).—An increaſe of the heat produces a decompoſition of its *Acid*, the *Alkali* remaining unchanged.—May be more rapidly decompoſed by the addition of *Charcoal*; hence the preparation of *Gun-powder*.—When decompoſed in the moiſt way, by treatment with the *Sulphuric*, furniſhes *Nitric Acid*.—100 parts dried at 70 *Farenh.* conſiſt of 44 of *Nitric Acid*, 51.8 of *Potaſh*, and 4.2 of *Water*.—Uſed extenſively in *Glaſs-making*, *Metallurgy*, preparation of *Gun-powder*, and for *dietetic* and *medical* purpoſes.

2d. *Nitrate of Soda*, called formerly *cubical* or *quadrangular Nitre*. In moſt of its properties reſembles the former.

3d. *Nitrate of Ammonia;* obtained by ſlow evaporation, from the combination of *Nitric Acid*, and *Ammonia.*—Form, *cryſtalline.*—Taſte, *cool, bitter, urinous.*—*Deliqueſcent.*—Eaſily *fuſible.*—Under cautious diſtillation, yields *Gaſeous Oxyd of Azote*, *Nitrous Gas*, and *Water;* but detonates when ſuddenly heated.

Nitric Acid diſſolves all the *Earthy Bodies* except *Silex.*

In its action on the *Metallic Bodies*, it is decompoſed to a greater or leſs degree according to their capability of uniting with a larger or ſmaller proportion of its *Oxygen.*

Similar effects produced on it by *Charcoal, Phoſphorus, Sulphur*, and moſt other combuſtible ſubſtances; as alſo by expoſure either to *Light* or *Heat.*

Hence the difference, if any, between *Nitrous* and *Nitric Acid*, and the formation of *Nitrous Gas*, and *Gaſeous Oxyd* of *Azote.*

In ſome inſtances, the reciprocal action ſuch as to occaſion immediate inflammation, as on mixture with *Eſſential Oils.*

Of the properties of *Nitrous Gas*—The moſt remarkable of theſe its re-producing *Nitric Acid* by the addition, and furniſhing pure *Azote* by the ſubtraction of *Oxygen.*

The different forms of the *Nitric Acid* therefore conſidered as reſulting from the union of theſe principles in different proportions.

100 parts of the *Dry Nitric Acid* ſaid to conſiſt of 68.06 *Nit. Gas* and 31.94 *Oxygen.*—100 parts of the *liquid Acid,* of 90 *Acid* and 10 *Water,* and 100 parts of *Nit. Gas* of 46.6 *Azote* and 53.4 *Oxygen,* the cubical inch of the *Gas* weighing 335 thouſandths of a grain.

The *Order* of *Attraction* of this acid, the ſame as that of the *Sulphuric.*

Chief uſes, in *Dying, Etching,* and *Aſſaying;* and ſometimes employed in *Medicine.*

Of Muriatic Acid.

Obtained by decompoſing *Muriate* of *Soda,* by means ſimilar to thoſe employed in the preparation of the *Nitric Acid.*

Its pureſt form *Gaſeous.*

In this ſtate one-fifth heavier than *Atmoſpherical Air;* of a pungent *odour; irreſpirable;* deſtructive to *Flame,* imparting to it under extinction a bright green colour; enflames the ſkin without diſcolouring or corroding it.

When dry has no action on the *Metals*, nor on any other of the *Combuſtible Subſtances.*

Expoſed to a moiſt atmoſphere it becomes *cloudy*—Is readily abſorbed both by *Water* and *Ice*, the latter of which it liquefies: in either caſe it occaſions an encreaſe of *Temperature* and augmentation of *Bulk*, communicating to the water the general properties of an *Acid* (*Acidum Muriaticum* P. L.)

In its liquid and more common form it readily diſſolves and unites with all the *Alkalies* and moſt of the *Earths.*—Its combinations with the former are,

1ſt. *Muriate of Potaſh*, formerly called *Salt* of *Silvius*; a ſalt but little uſed.

2d. *Muriate of Soda* (*Common Salt*); obtained by evaporation from *Sea Water*, or the water of *ſalt Springs*, or the ſolution of *Rock Salt*, which is found in ſeveral parts of the world in immenſe quantities.—Form of its cryſtals *cubical.*—Taſte, agreeably *ſaline.*—Equally ſoluble in cold *Water* as in hot; ſoluble alſo in *Spirit.*—Cryſtals burſt or decrepitate on ſudden expoſure to *Heat.* Melt in a red heat without decompoſition.

ſition. May be converted into vapour by being intenſely heated.—Promote the fuſion of many of the *earthy* and *metallic* bodies.—May be decompoſed in the moiſt way by *Sulphuric* and *Nitric Acids ;* and in the dry way, by the *Phoſphoric*, *Boracic*, and *Arſenic.*—May alſo be decompoſed by *Oxyd* of *Lead ;* hence the preparation of *Turner's Patent Yellow.*—100 parts dried at 80 *Farenh.* conſiſt of 38.88 *Mur. Acid*, 53 *Soda*, and 8.12 *Water.*—Of extenſive application in *Agriculture*, *Glaſs-making*, *Glazing*, *Metallurgy*, *Soap-making*, *Diet*, *Pharmaceutic Chemiſtry*, &c.

3d. *Muriate of Ammonia*, (*Sal Ammoniacus* P. L.); found native in the neighbourhood of *Volcanos ;* prepared alſo, in large quantities, in the dry way, by double chemical affinity, from a mixture of *Sulphate of Ammonia* and *Muriate of Soda.*—Form, *concrete.*—Taſte, *penetrating*, *acrid*, *urinous.*—Soluble both in *Water* and *Spirit.*—Cryſtalliſes under evaporation into ſmall quadrangular *Priſms.*—Yields its baſis readily to both the fixed alkalies, and to lime:—is alſo partially decompoſed by ſublimation with oxyd of iron (*Ferrum Ammoniacale* P. L.).—Of extenſive application in *Dying*, *Tinning*, *Soldering*, &c. Uſed alſo frequently in *Medicine.* It capacity of communicating a tinge to *Glaſs*, and their ſpecific gravity not exceeding that of *Water* more than in the proportion of 5 to 1.

Theſe characters poſſeſſed more perfectly by ſome of the earths than by others: hence their diſtinction into *ſaline* and *inſipid*.

All the earths ſoluble in one or other of the *Acids*: cannot however be precipitated from their ſolutions, like the *Metals*, by *Pruſſiate* of *Potaſh* or of *Lime*.

Infuſible even by the moſt intenſe degrees of *heat*, unleſs in a ſtate of mixture; viz. with *each other*, with *Alkalies* or *other Salts*, or with *Metallic Oxyds*.

The earths at preſent known are, *Baryt*, *Strontian*, *Lime*, *Magneſia*, *Alumine*, *Silex*, *Zircone* or *Jargon Earth*, *Glucine*, *Yttria*, and *Aguſtine*.

Of theſe *Lime*, *Alumine*, *Silex*, and *Magneſia*, by far the moſt abundant and uſeful.

Of Baryt, or *Ponderous Earth*.

Found in combination, 1ſt, with Carbonic Acid, *Carbonate* of *Baryt*; 2d. with Sulphu-

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ric Acid (*Sulphate* of *Baryt*, *Baroſelenite*); or, 3d. with Sulphuric Acid, Silex, Sulphate of Alumine, Sulphate of Lime, and Petroleum, (*Liver Stone*).

Obtained in a cauſtic or ſeparate ſtate, by expoſing a mixture of *Carbonate* of *Baryt* and *Charcoal*, or *Nitrate* of *Baryt*, to a ſtrong heat.

Colour *greyiſh*.—Taſte *cauſtic*.—Specific gravity 4. 000.

Slakes like *Lime* on expoſure to air, and imbibes water with avidity, forming with it a powerful cement.

Soluble in about 25 times its weight of cold, and in leſs than twice its weight of boiling water (*Barytic Water*), from which in cooling it cryſtalliſes in tranſparent priſms.

Imparts a lemon colour to the flame of *Alcohol*.

Unites with the *Sulphuric Acid* into a compound requiring for its ſolution 40,000 times its weight of *Water*.

With the *Nitric* and *Muriatic Acids*, forms cryſtalliſable Salts.

On *Charcoal* melts, by the heat of the lamp, into liquid globules: melts alſo, with effervefcence, both with *Microcoſmic Salt* and *Borax*; but infuſible when in mixture either with *Lime* or with *Magneſia*.

Unites with *Sulphur* into a ſpecies of Hepar (*Sulphuret* of *Baryt.*)

Order of attraction in the moiſt way, *Sulphuric Acid*, *Oxalic*, *Succinic*, *Fluoric*, *Phoſphoric*, *Saccho-lactic*, *Suberic*, *Nitric*, *Muriatic*, *Sebacic*, *Citric*, *Tartareous*, *Arſenic*, *Formic*, *Lactic*, *Benzoic*, *Acetous*, *Boracic*, *Sulphureous*, *Nitrous*, *Carbonic*, and *Pruſſic*; *Sulphur*, *Phoſphorous Water*, *Unctuous Oils*; in the dry way, *Phoſphoric*, *Boracic*, *Arſenic*, *Sulphuric*, *Succinic*, *Fluoric*, *Nitric*, *Muriatic*, *Sebacic*, *Formic*, *Lactic*, *Benzoic*, and *Acetous Acid*; *Potaſh*, *Soda*, *Sulphur*, *Oxyd of Lead.*

The *Carbonate* of *Baryt* and other forms of this earth, remarkable for their violent effects, when exhibited internally.

Uſed principally as a teſt for aſcertaining the preſence of *Sulphuric Acid.*

Of Strontian.

Found either in combination, with carbonic acid, *Strontianite*; or with ſulphuric acid, *Sulphate* of *Strontian.*

Beſt obtained in a ſeparate or pure ſtate from

Carbonate or *Nitrate* of *Strontian*, by expoſing them to a ſtrong heat, as in the preparation of *Baryt*, to which it is analagous in many of its properties.

Remarkable for the brilliancy of the flame which it exhibits when treated on charcoal by the blow-pipe; alſo for the red colour which it imparts to the flame of *Alcohol.*

The order of its attraction nearly the ſame with that of *Baryt*, though inferior to it in degree.

Of Lime, or Calcareous Earth.

Found 1ſt. uncombined, *Native Quicklime;* 2d. in union with Carbonic Acid and Water, *Calcareous Spar*, *Marble*, *Lime-ſtone*, *Chalk*, &c. 3d. with Carbonic Acid and Petroleum, *Swine-Stone;* 4th. with Carbonic Acid and Oxyd of Mangaueſe, *Sidero-Calcite;* 5th. with Carbonic Acid and Carbonate of Baryt, *Baryto-calcite;* 6th. with Carbonic Acid, Carbonate of Magneſia, Iron, and Manganeſe, *Muri-Calcite;* 7th. with Carbonic Acid, Magneſia, Alumine, and Iron, *Schieſer Spar;* 8th. with exceſs of Carbonic Acid, Alumine, Magneſia, and Iron, *Dolomite;* 9th. with Fluoric Acid and Water, *Fluor;* 10th. with Phoſphoric Acid, *Apatite;* and 11th. with Sulphuric Acid and Water, *Gypſum*, *Selenite*, *Plaſter of Paris*.

Prepared for various purpoſes from *Carbonate of Lime*, by the continued application of a ſtrong heat.

Form *concrete* or *powdery*. Taſte *hot*, *pungent*, *cauſtic*. Specific gravity 2. 3.

Soluble in about 700 times its weight of water (*Aqua Calcis* P. L.) Changes vegetable blue colours to green.

On being ſuddenly moiſtened, emits both *Heat* and *Light*, loſing at the ſame time its attraction of coheſion, *Slaked Lime*. The ſame takes place ſpontaneouſly on expoſure to *Air*. On further expoſure attracts Carbonic Acid from the Atmoſphere; hence the increaſe of hardneſs obſervable in *calcareous Cements*.

Though infuſible *per ſe*, promotes very powerfully the fuſion of moſt of the other earthy Bodies: hence its uſe in working metallic ores, more eſpecially thoſe of *Iron*.

Melts with *Borax* and *Microcoſmic Salt*, without effervеſcence. Melts alſo with *Oxyd of Lead.*

Forms, with the *Sulphuric Acid*, a compound of little ſolubility in water, *(Gypſum)*; with the *Nitric* and *Muriatic*, ſalts ſtrongly deliqueſcent.

With *Sulphur*, a calcareous Hepar; with *Phoſphorus* a liver coloured compound, which yields *Phoſphorated Hydrogen Gas* on the affuſion of water; with *unctuous ſubſtances*, peculiar *Soaps.*

Suppoſed in many inſtances to be of animal origin.

Order of attraction in the moiſt way, *Oxalic Acid*, *Suberic*, *Sulphuric*, *Tartareous*, *Succinic*, *Phoſphoric*, *Saccho-lactic*, *Nitric*, *Muriatic*, *Sebacic*, *Fluoric*, *Arſenic*, *Formic*, *Lactic*, *Citric*, *Benzoic*, *Acetous*, *Boracic*, *Sulphureous*, *Nitrous*, *Carbonic*, and *Pruſſic*, *Sulphur*, *Phoſphorous*, *Unctuous Oils*, *Water;* in the dry way, *Phoſphoric*, *Boracic*, *Arſenic*, *Sulphuric*, *Succinic*, *Nitric*, *Muriatic*, *Sebacic*, *Fluoric*, *Formic*, *Lactic*, *Benzoic*, and *Acetic Acid; Potaſh*, *Sulphur*, *Oxyd of Lead.*

Uſed extenſively as the baſis of *Calcareous Cements*, *Plaſter* and *Stucco;* in *Dying*, *Bleaching*, *Tanning*, *Sugar-baking*, and various other arts, beſides its application in *Medicine.*

Of Magneſia, or Muriatic Earth.

Found 1ſt. in union with Lime and ſome Iron, *Calci-murite;* 2d. with Silex, Alumine, Lime, Oxyd of Iron and Water, *Argillo-murite*; 3d. with Carbonic Acid, Silex and Iron, *Silici-murite;* 4th. with Silex and Alumine, *Talc;* 5th. with Silex, Alumine, Iron, and Carbonate of Lime, *Lapis Ollaris*; 6th. with Silex, Alumine, Iron, Air and Water, *Steatite;* 7th. with Silex, Iron, Carbonate of Lime, Alumine, Muriate of Magneſia, and Water, *Serpentine;* 8th. with Silex, Alumine, Lime, Iron, Air, and Water, *Chlorite;* 9th. with Carbonic Acid, Silex, Carbonate of Lime, Alumine, and Oxyd of Iron, in different proportions, *Aſbeſtos*, *Amianthus*, *Suber montanum*, *Actynolite*, and *Jade;* 10th. with Silex, Lime, and Oxyd of Iron, *Baikalite;* 11th. with the Boracic Acid, Lime, Silex, Alumine, and Iron *Boracite*; and 12th with Sulphuric Acid, *Sulphate of Magneſia.*, *Epſom Salt.*

Prepared from a ſolution of this laſt, by the addition of *Carbonate of Potaſh*, and ſubſequent

expoſure

expoſure of the waſhed earthy precipitate to a ſtrong and continued heat (*Magneſia uſta* P. L.)

Form *pulverulent.* Colour *pure white.* Taſte *inſipid.* Specific gravity about 2. 3.

Requires for its ſolution 7900 times its weight of water. Tinges vegetable blues of a light green.

Infuſible without addition, even in the moſt intenſe degrees of heat, by which it is merely contracted in its dimenſions; but melts into a glaſs with *Lime*, *Microcoſmic ſalt*, or *Borax*, or with a mixture of *alumine* and *ſilex.*

Unites with all the Acids. With the *Sulphuric Acid* regenerates *Sulphate of Magneſia (Magneſia Vitriolata* P. L.*)* With *Carbonic Acid*, Carbonate of Magneſia *(Magneſia Alba* P. L.*)*

May be combined, in ſmall proportions, with *Sulphur.*

Order of Attraction in the moiſt way *Oxalic Acid*, *Phoſphoric*, *Sulphuric*, *Fluoric*, *Sebacic*, *Arſenic*, *Saccho-lactic*, *Succinic*, *Nitric*, *Muriatic*, *Tartareous*, *Citric*, *Formic*, *Lactic*, *Benzoic*, *Acetous*, *Boracic*, *Sulphureous*, *Nitrous*, *Carbonic*, and *Pruſſic.*

Pruſſic, *Sulphur*, *Phoſphorus*, *Water*; in the dry way, *Phoſphoric*, *Boracic*, *Arſenic*, *Sulphuric*, *Fluoric*, *Sebacic*, *Succinic*, *Nitric*, *Muriatic*, *Formic*, *Lactic*, *Benzoic* and *Acetic Acid*; *Potaſh*, *Sulphur*, *Oxyd of Lead*.

In common uſe in diſorders of the *Primæ Viæ* as an *antacid* and *laxative*, and in the form of ſteatite as an ingredient in the Manufacture of the finer kinds of *Pottery*.

Of Alumine, or Argillaceous Earth.

Found united to, 1ſt. Carbonic Acid and Lime, *Lac Lunæ*; 2d. to Silex, *Clay*; 3d. to Silex, Carbonate of Lime, Carbonate of Magneſia, Oxyd of Iron, Air and Water, in different proportions, *Lithomarga*, *Fuller's Earth* and *Bole*; 4th. to Silex and Iron, *Tripoli*; 5th. to Silex, Oxyd of Iron, Manganeſe, Water and Air, *Lepidolite*; 6th. to Silex, Magneſia, Iron and Lime, in different proportions, *Sapari*, *Hornblende*, and *Baſalt*; 7th. to Silex, Magneſia,

ſia, and Oxyd of Iron, *Mica;* without Magneſia, *Micarelle;* 8th. to Silex, Iron, and Carbonate of Lime, *Calp;* 9th. to Silex, Magneſia, Iron, and Petroleum, *Argillaceous Schiſtus;* and 10th. to Sulphuric Acid, *Sulphate of Alumine.*

Obtained in its pureſt form from a ſolution of *Sulphate of Alumine*, by the addition of *Potaſh, Soda*, or *Ammoniac;* hence its preſent denomination.

Form *powdery.* Colour, when dry, *pure white.* Feel *unctuous.* Taſte *inſipid.* Smell when breathed on, *earthy.* Specific gravity 2.

Inſoluble in *Water.* When moiſtened becomes plaſtic, and contracts and hardens when expoſed to the higher degrees of *Heat;* therefore the baſis of the different kinds of *Pottery.* After baking is no longer capable of becoming plaſtic.

Soluble in the humid way by *Alkalies.*

Fuſible, with efferveſcence, both with *Microcoſmic Salt*, and *Borax*, fuſible alſo with *Lime.*

Combines with moſt *Acids*, though with difficulty, except under precipitation, and produces with them compounds which are more or leſs aſtringent. The moſt important of theſe, the *Sulphate of Alumine* or *common Alum*, prepared from the decompoſition of *Argillaceous Schiſtus.* This properly a triple, ſometimes a quadruple, ſalt. Form of its cryſtals *octohedral.* Taſte *aſtringent.* Soluble in about 14 times its weight of cold, and ſomewhat more than an equal weight of boiling water. Undergoes watery fuſion, and parts with its water of cryſtallization, on expoſure to *Heat (Alumen Uſtum* P.L.*)* When calcined with certain inflammable ſubſtances, as yolk of egg, or ſugar, produces a compound, which takes fire ſpontaneouſly on expoſure to *Air (Pyrophorus* of *Homberg.)*

Has of all the *Earths* the greateſt attraction for *Metallic Oxyds*; has alſo a ſtrong attraction both for *Silex* and *Magneſia.*

Order of Attraction of *Alumine* in the moiſt way, *Sulphuric Acid, Nitric, Muriatic, Oxalic, Arſenic, Fluoric, Sebacic, Tartareous, Succinic, Saccho-lactic, Citric, Phoſphoric, Formic, Lactic, Benzoic, Acetous, Boracic, Sulphureous, Nitrous, Carbonic, and Pruſſic;* in the dry way, *Phoſphoric, Boracic, Arſenic, Sulphuric, Nitric, Muriatic, Fluoric, Sebacic, Succinic, Formic, Lactic, Benzoic,*

Benzoic, and *Acetic Acid; Potaſh, Sulphur, Oxyd of Lead.*

Uſes, comprehending thoſe of Sulphate of Alumine, *Dying, Tanning, Printing, Silvering, Painting, Pottery, Medicine*, &c.

Of Silex.

Found in union, 1ſt. with Alumine, Lime, and Iron, as in moſt of the *precious Stones, Hyalite* and *Prehnite;* 2d. with Alumine only, *Schorlite*, and *Calcedony;* 3d. with Alumine and Iron, *Olivin, Elaſtic Quartz, Obſidian, Opal, Pitch-ſtone, Hornſlate, Jaſper*, and *Argentine Felſpar;* 4th. with Alumine, Lime, Magneſia and Iron, *Schorl, Thumerſtein* and *Siliceous Spar;* 5th. with Alumine, Iron and Manganeſe, *Rubellite;* 6th. with Alumine and Lime, *Quartz, Flint, Hornſtone*, and *Ædelite*, and with water *Zeolite;* 7th. with Oxyd of Nickel, Lime, Alumine, and Oxyd of Iron, *Chryſopraſe;* 8th. with Lime, Magneſia, Iron and Coal, *Silicious*

Schiſtus ; 9th. with Alumine, Lime, Sulphate of Baryt, Magneſia, and Iron, *Adularia;* without Iron, *Felſpar* ; 10th. with Alumine, Sulphate of Lime and Oxyds of Copper and Iron, *Labrador Felſpar ;* 11th. with Alumine, Baryt and Water, *Staurolite ;* and 12th. with Lime, Sulphate of Lime and Iron, *Lapis Lazuli.*

May be ſeparated from moſt of theſe by digeſtion in *Nitric Acid,* and further purified by fuſion with either of the fixed alkalies, and redigeſtion in the nitric or any other of the ſtronger acids.

Colour *white. Inſipid. Dry* to the touch. Sparingly if at all ſoluble in *Water.* Specific gravity 2. 66. *Infuſible.*

Soluble in the *Fluoric,* but in no other acid.

Soluble alſo in the ſolution of either of the *fixed Alkalis,* by the aſſiſtance of heat. Precipitates and combines with lime on being added to lime water; unites too in the humid way with ſome of the metallic oxyds.

May be fuſed with *Lime, Microcoſmic Salt,* or *Borax* ; but much more readily with *Potaſh* or *Soda :* hence the preparation of the different kinds of *Glaſs.*

When melted with a large proportion of *Alkali*, forms a deliqueſcent compound, (*Liquor Silicum*,) the decompoſition of which by an *Acid*, furniſhes a gelatinous precipitate, thought to be ſoluble in about 1000 parts of *Water*.

Order of Attraction in the moiſt way, *Fluoric Acid*, *Potaſh*; in the dry way, *Potaſh*, *Boracic Acid*, *Phoſphoric Acid*, *Oxyd of Lead*.

Uſed principally in *Poliſhing*, *Painting*, and *Glaſs-making*.

Of Zircon, or *Jargon Earth*.

Combined with ſilex, iron, and nickel in the ſtone called *Jargon* or *Zircon*: found alſo in the *Hyacinth*.

Obtained from theſe by fuſion with potaſh, and ſubſequent ſolution in, and precipitation from the *Muriatic Acid*.

Colour, *white*. Inſoluble in water; when moiſt, *ſemi-tranſparent*. Specific gravity eſtimated at 4. 300.

When heated in contact with charcoal, is imperfectly

perfectly vitrified, and becomes of ſufficient hardneſs to ſtrike fire with ſteel.

Reſembles *Silex* in its action on *Metallic Oxyds*, and *Alumine* in forming aſtringent compounds with the *Acids*: but differs from both in being inſoluble in the *Fixed Alkalies*.

Order of its attraction as yet unknown.

Of Glucine.

Obtained by the analyſis of *Aquamarine*, the *Beryl*, and the *Emerald*.

Colour, *white*. *Inſipid*. *Inſoluble* in water. *Adheſive* to the tongue. *Infuſible per ſe*; but melts with *Borax* into a tranſparent *Glaſs*.

Soluble in moſt of the *Acids*, and likewiſe in the ſolutions of the fixed *Alkalies* and of *Carbonate* of *Ammonia*.

Its *ſaline* compounds ſlightly aſtringent, and of a *ſweet taſte*: hence its name.

Its *Sulphate* remarkable for giving a yellowiſh white precipitate on the addition of *Infuſion* of *Gall Nuts.*

Its affinity for *Acids* intermediate between that of *Magneſia* and of *Alumine.*

Yttria.

Found in the *Gadolinite*, a Swediſh ſtone, ſo called from this earth being diſcovered in it by *M. Gadolin.*

Colour of this earth *pure white*—Without *taſte* or *ſmell*—*Infuſible*—With *Borax* melts into a white tranſparent glaſs—Soluble in *Carbonate* of *Ammonia*, though not in either of the *cauſtic fixed Alkalies.*

With the *Sulphuric*, *Nitric*, *Muriatic*, and with other acids, forms compounds remarkable, like thoſe of *Glucine*, for their aſtringency and ſweetneſs, to which earth it is conſidered in many reſpects as analogous, though in others eſſentially different.

Aguſtine.

Diſcovered by *M. Trommſdorff* in the *Beril* of *Georgenſtadt.*—When pure reſembles *Alumine*—

mine—Is inſoluble in *Water* and not affected by *Alkalies*, whether pure or carbonated, even by the aſſiſtance of heat—Unites readily with *Acids* with which it forms compounds having little or no taſte, and on this account has received its name.

Of METALS.

Found generally in the clefts or fiſſures of ſtony or other ſtrata, forming what are called *Metallic Veins;* or in indeterminate *Maſſes;* or in *Beds;* or *deſſeminated* through other ſubſtances.

In theſe inſtances they are either *native*; or *alloyed* with each other; or in different ſtates of *Oxydation;* or *mineralized* with certain combuſtible bodies, particularly *Sulphur;* or laſtly, combined with one or other of the *Acids*.

Different proceſſes therefore commonly neceſſary for obtaining them in their ſeparate and

proper

proper forms; as, *Pounding*, *Waſhing*, *Roaſting*, *Amalgamation*, *Reduction*, and *Refinement.*

When pure, eaſily diſtinguiſhed from other bodies by their united properties of *Weight*, *Opacity* and *Splendour*, as well as by their power of conducting the *Electric* and *Galvanic Fluids.*

Some remarkable for their *Ductility*, or *Malleability*, or both; others for their comparative *Brittleneſs:* hence the *common* though *inaccurate* diſtinction into *Metals* and *Semi-metals.*

Differ alſo from each other in their comparative *Hardneſs* and *Softneſs:* when hardened by mechanical extenſion, may be made ſoft again by expoſure to a red heat—*Annealing.*

All *fuſible* in cloſe veſſels if heated to their reſpectively neceſſary degrees; are convex when in fuſion, and in cooling diſpoſed to *cryſtalliſe.*

Some, particularly *Iron* and *Platina*, grow ſoft before they melt, and hence are capable of being united by the operation of *Welding.*

Some, as *Platina*, *Gold* and *Silver*, remain *fixed* during fuſion; others, as *Quickſilver*, *Arſenic*, *Zinc* and *Antimony* are *volatile* or convertible into a ſtate of *Vapour.*

Variouſly affected on expoſure to *Air*, by which in ſome inſtances they are merely *tarniſhed*, in others deprived of their metallic properties more completely, being converted into a ſtate of *Oxyd:* hence the utility of *Tinning*, *Silvering*, *Gilding*, &c.

All, except *Platina*, *Gold* and *Silver*, ſtill more readily *oxydated* by the united action of *Air* and *Heat;* hence their diviſion into *Noble* and *Baſe* metals. The circumſtances in which theſe differ from each other in their *Oxydation* are; the comparative facility with which they become *oxydated*, the temperature required for that purpoſe, the quantity of *Oxygen* which they reſpectively imbibe, the force with which they afterwards retain it, and the phenomena which they preſent during *Oxydation.*

Of *perfect* and *imperfect* metallic oxyds.

Metallic Oxyds, however produced, vary in their properties, not only from each other, but alſo from their reſpective metals. Thoſe of the volatile metals much more fixed than the metals themſelves:—Some capable of being decompoſed or deprived of their *Oxygen* by heat alone, as thoſe of *Platina*, *Gold*, *Silver*

and

and *Quickſilver*—Such as are not decompoſed by the ſimple application of heat are *vitrifiable*; hence the neceſſity of *Fluxes*.

Remarkable for the *Colours* and ſometimes for the *Opacity* which they communicate to *Glaſs*: hence the preparation of *Paſtes* in imitation of precious ſtones, and alſo the preparation of *Enamels*.

Few of the *Metals* at a common temperature have any conſiderable action upon *Water*, in general therefore void of *Taſte*; ſome however when aided by a red heat readily decompoſe it, and are thereby converted into *Oxyds*: hence the explanation of their effects on various other fluids.

Previous *Oxydation* neceſſary to their combination with acids (*Metallic Salts.*) Hence, in their ſolution, the partial decompoſition of the *Acid* itſelf, or of the *Water* by which it is diluted; and the conſequent evolution of *Sulphureous*, *Nitrous* or *Hydrogen* gas.

In ſome inſtances they are furniſhed with ſo large a proportion of *Oxygen* as to become *inſoluble*, in others acidified. (*Acid of Arſenic*, of *Molybdena*, &c.)

Metallic Salts for the moſt part poſſeſſed of *Colour* and more or leſs *Corroſive.*

The *Acidifiable Metals*, and thoſe, the *Oxyds* of which have a diſpoſition to combine with *Earths* and *Alkalis*, may be readily *oxydated* by theſe through the medium of *Water.*

Many *Metallic Oxyds* ſoluble in ſolutions of the *Alkalis*, forming with them permanent compounds. The partial decompoſition of the *Oxyd* by the *Alkali* ſometimes neceſſary to this.

Neutral Salts acted on ſlowly by *Metals* unleſs aided by *heat*, which, by aſſiſting to decompoſe their acids, *oxydates* the metal and renders it combinable with the *Alkali.*

Metallic Oxyds already formed ſometimes combine with *Neutral Salts*, and produce with them triple compounds.

Iron the only metal capable of combining with *Charcoal;* but this, and almoſt all the others, or their *Oxyds*, unite readily with *Sulphur*, their common mineralizer: many alſo combine with *Phoſphorus*, and form fuſible compounds.

With very few exceptions they unite with each other by fuſion in all proportions.

The metals at preſent known are the following; *Platina*, *Gold*, *Silver*, *Quick-ſilver*, *Lead*, *Copper*, *Iron*, *Tin*, *Biſmuth*, *Nickel*, *Arſenic*, *Cobalt*, *Zinc*, *Antimony*, *Mangane ſe*, *Wolfram* *Uranium*, *Molybdena*, *Titanium*, *Tellurium*, *Chrome* and *Columbium*.

Of Platina.

Brought from *South America*, in ſmall grains of a dull ſilver colour, and commonly mixed with *Quick-ſilver*, *Ferruginous Sand*, and particles of *Native Gold*. Found alſo ſometimes, though rarely, in lumps — Bed and matrix unknown.

Manner of purifying, by fuſion with *Phoſphorus*; or amalgamation with *Quick-ſilver*, and ſolution in *Oxy-muriatic Acid*—Wrought in the large way by repeatedly melting with *Arſenic* and *Potaſh*, and ſubſequent roaſting and hammering.

When pure, of a *Silver white* colour, inclining to *Iron-grey*.

Malleability and *Ductility* intermediate between thoſe of *Gold* and *Silver* — *Hardneſs* greater than that of either—*Tenacity* next to *Copper* — *Specific Gravity* from 20,850 to 24,000, according to the degree of compreſſion.

Extremely difficult of *Fuſion;* but when urged by an intenſe heat, becomes capable of being *welded*, though imperfectly.

Leſs diſpoſed to *tarniſh* than either *Gold* or *Silver* on expoſure to air—and not *Oxydable* by it even under the ſtrongeſt heat; but may be reduced to a powdery *Oxyd* by the *Electrical Spark.*

Soluble only in the *Nitro* and *Oxy-muriatic Acids,* to which it communicates at firſt a *yellow,* and afterwards a deep *reddiſh brown* colour.

Precipitable from its ſolutions in theſe by the *Alkalis* and ſeveral of their compounds—With *Muriate* of *Ammonia,* as with many of the others, it forms a *Triple Salt,* which on being ſubmitted to an intenſe heat, furniſhes the pure *Metal.*—Precipitable alſo by many of the other metals and their ſolutions, more eſpecially by *Tin.*

In its metallic ſtate is not acted on, in the dry way, by *Earths* or *Alkalis*, or any of their compound ſalts, except the *Nitrate* and *Oxymuriate* of *Potaſh*, by which it is ſuperficially *oxydated*,

Has no affinity with *Sulphur;* but, like *Gold*, is ſoluble in *Alkaline Sulphurets*—Combines readily with *Phoſphorus*.

When pure, amalgamates intimately with *Quick-ſilver*, and unites by fuſion, in different proportions, with moſt of the other *Metals*—moſt eaſily with *Zinc*—with *Copper* produces a golden coloured, hard and durable compound, which is malleable, cloſe grained, and ſuſceptible of a fine poliſh—remarkable for giving a conſiderable degree of toughneſs to *Caſt Iron*. With *ſteel* forms a compound incapable of being touched by the file.

Order of attraction, in the moiſt way, *Æther; Muriatic*, *Oxy-muriatic*, *Nitric*, *Sulphuric*, *Arſenic*, *Fluoric*, *Tartareous*, *Phoſphoric*, *Sebacic*, *Oxalic*, *Citric*, *Formic*, *Lactic*, *Acetic*, and *Succinic Acids;* in the dry way, *Arſenic—Gold—Copper—Tin—Biſmuth—Zinc—Antimony—Nickel—Cobalt—Manganeſe—Iron—Lead—Silver—Quick-ſilver*—and *Sulphuret* of *Potaſh*.

Uſe as yet, principally confined to *Chemical* and *Philoſophical* purpoſes.

Of Gold.

Though leſs abundant, yet occurs more generally than moſt of the other *Metals.*

Found, either alloyed with a ſmall proportion of Silver, Copper, Iron—*Native Gold;* or, combined with Sulphur, Antimony, Arſenic, Lead, Iron and Silver—*Grey Gold Ore;* or, with Biſmuth and Sulphur—*White Gold Ore—Aurum Graphicum.*

Manner of collecting it from its ores.

When pure, of a *bright yellow* colour; *ſoft; inelaſtic; flexible;* very *tough; ductile* and *malleable* to an extraordinary degree; not *ſonorous.*

Next to Platina the *heavieſt* of the metals; its ſpecific gravity when uncompreſſed being 19. 30.

Scarcely *tarniſhes* even by continued expoſure to air or moiſture.

Melts ſoon after becoming red hot, or at 32° *Wedgw.*—5237 *Farenht.*—Whilſt in fuſion, of a *ſea green* colour.

Though unalterable in the common fire, may, by a more intenſe degree of heat, be *volatilized*, or imperfectly *oxydated.*

Cryſtalliſes in cooling, into quadrangular pyramids.

If fuſed by the loweſt degree of heat required for that purpoſe, becomes afterwards *brittle*—becomes alſo *hard* and *brittle* by compreſſion: hence the neceſſity of *Annealing*.

In the form of Gold leaf, is converted by *Electrical Exploſions* into a *purple Oxyd;* and when ignited by the *Galvanic Fluid*, burns with *vivid white* flame, inclining to *blue.*—Said alſo to be capable of being *inflamed* when plunged into concentrated *Oxy-muriatic acid Gas.*

Like Platina, *ſoluble* only in the *Oxy* and *Nitro-muriatic Acids*, without effervefcence; and in the ſolutions of *Alkaline Sulphurets*—Its acid ſolutions of a *yellow* colour and *cauſtic*, ſtain the ſkin *purple*, and, when evaporated, yield deliqueſcent cryſtals, which like the oxyds of this metal are decompoſed by ſimple heat.

Gold ſeparable from its ſolutions by *Æthers*, *Eſſential Oils*, *Phoſphorus*, *Hydrogen Gas*, *burning Sulphur*, &c. May likewiſe be precipitated by all the *Alkalis*, and *Earths* in the form of a *yellow Oxyd*, which by expoſure to light is partially decompoſed, and becomes of a *purple* colour, and no longer ſoluble in acids.

The precipitate by *Ammonia* long known for the property of exploding with great violence when expoſed to a moderate heat *(Aurum Fulminans.)*—This an *Ammoniacal Oxyd*, the exploſive power of which depends on the double decompoſition which takes place between the *Oxyd* and the *Ammoniac;* hence the effects of expoſing *Aurum Fulminans* to a gentle heat, or of mixing it with *Oil* or *Sulphur*, or of heating it under ſtrong *Compreſſion.*

The precipitate of Gold by *Tin—(Purple Powder of Caſſius,)* proved by the experiments of *Pelletier* to be an intimate mixture of *Oxyd* of *Tin* with imperfect *Oxyd* of *Gold.*

Gold diſtinguiſhable from Platina, by being precipitable from its ſolution by *green Sulphate of Iron;* but not by *Muriate of Ammonia.*

Its *Oxyds* unite by means of *Alkalis* with the *vitrifiable Earths.*

Has no affinity in its metallic ſtate, for either *Sulphur* or *Carbon;* but unites with a ſmall proportion of *Phoſphorus*, and thereby becomes *paler*, and more *fuſible.*

Combines with all the *Metals* in various proportions, acquiring different ſhades of colour and hardneſs, according to the quantity of alloy.

With *Copper* aſſumes a deeper colour and becomes more fuſible, harder, and more elaſtic.

Amalgamates readily with *Quick-ſilver;* hence the art of water-gilding, and manner of collecting it from its ores, as before mentioned.

May be freed from admixture of imperfect metallic matter, by fuſion with *Lead*, or *Biſmuth* under free acceſs of air; hence the proceſs of Cupellation.

Moſt eaſily and effectually ſeparated from *Silver* by diluted *Nitric Acid.*

Order of attraction; in the moiſt way, *Æther*, *Muriatic*, *Oxy-muriatic*, *Nitric*, *Sulphuric*, *Arſenic*, *Fluoric*, *Tartareous*, *Phoſphoric*, *Sebacic*, and *Pruſſic Acid*, *Potaſh*, *Ammoniac;* in the dry way, *Quick-ſilver*, *Copper*, *Silver*, *Lead*, *Biſmuth*, *Tin*, *Antimony*, *Iron*, *Platina*, *Zinc*, *Nickel*, *Arſenic*, *Cobalt*, *Manganeſe*, *Sulphuret* of *Potaſh.*

Uſed extenſively in the conſtruction of *Utenſils*, and different kinds of *Ornaments;* in *Enamelling*, *Gilding*, *Dying*, *Soldering*, &c.

Of Silver.

Found, 1*ſt.* united to a ſmall proportion of Gold, Copper, or Iron, *Native Silver.*—2*d.* in alloy with Antimony, or with Antimony, Arſenic and Iron—*Antimoniated* and *Arſenical Silver Ores;* 3*d.* mineralized by Sulphur—*Vitreous Silver Ore;* 4*th.* combined, in the ſtate of oxyd, with oxyd of Antimony and Sulphur—*Red Silver Ore;* 5*th.* with Lead, Sulphur, Antimony, Iron, Alumine and Silex—*White Silver Ore;* 6*th.* with Muriatic Acid, Oxyd of Iron, Alumin, and a little Sulphuric Acid—*Horn Silver Ore.*

Manner of extracting it from its ores.—Purified by *Cupellation* or reduction from *Muriate of Silver.*

Colour *white*—has neither *Smell* nor *Taſte* —is leſs *ductile* and *tenaceous* than Gold; but *harder*, more *ſplendid* and more *opake*—*Elaſticity* between *Gold* and *Copper*—very *ſonorous* —*Specific Gravity* from 10,253 to 11,091.

Tarniſhes on expoſure to air, and becomes occaſionally encruſted with *Sulphuret of Silver*.

Melts below a white heat, or at 28 *Wedgw.* =4717 *Farenh.* Is very *brilliant* when in fuſion—and in cooling, *cryſtalliſes* into quadrangular pyramids or octahedrons.—By intenſe heat may, like *Gold*, be *volatilized* and partially *oxydated*.

By *electrical exploſions* is converted into an *Oxyd* of a greeniſh grey colour—by the *Galvanic Fluid* burns with an *emerald-green* flame.

Its *Oxyds* decompoſeable by *Heat* alone.

Moſt readily *ſoluble* in *Nitric Acid*—the ſolution *bitter* and *corroſive*—ſtains the ſkin and other animal ſubſtances *black*.

Upon evaporation yields a cryſtalliſable ſalt, ſuſceptible of watery fuſion (*Argentum Nitratum P. L.*) Yields a *Metallic Precipitate* to many of the other *Metals*, as alſo to *Phoſphorus*, burning *Charcoal*, burning *Sulphur*, &c.—and

an *Oxyd* of ſilver to the *Fixed Alkalis* and *Earths.*—With *Ammonia* forms a triple compound ſtill more remarkable for its fulminating property than that of *Gold* (*Argentum-Fulminans.*) Manner of preparing this—and cauſes of failure.

Silver alſo ſoluble in Nitro-Sulphuric Acid (*Aqua Regina* of *Keir.*)

And in the common *Sulphuric Acid* by the aſſiſtance of a boiling heat.

Although ſlightly or not at all acted on by the other *Acids*, many combine readily with its *Oxyd;* hence the decompoſition of *Nitrate of Silver* by *Muriatic* or *Oxy-muriatic Acid*, and their compounds, and the conſequent formation of Muriate of Silver (*Luna Cornea.*) This remarkable for its eaſy *Fuſibility*, *Inſolubility* in water, and becoming *dark coloured* on expoſure to *Light*, which produces a change of colour, equally ſtriking, in *Chromate of Silver.*

Silver, in its *metallic ſtate*, not combinable either with *Alkalis* or *Earths*, or with any of their ſaline compounds.

In the ſtate of *Oxyd* it communicates a *yellowiſh olive* or *brown* colour to glaſs.

Unites in various proportions with moſt of the other *Metals*, and with all the other *combuſtible Bodies*, *Carbon*, *Azote* and *Hydrogen* excepted.—Loſes its *Ductility* by combination with *Tin*, and with Copper, its uſual alloy, becomes *harder* and more *ſonorous*.—Forms a *dark violet coloured* maſs with *Sulphur*.—With *Phoſphorus* becomes more *fuſible* and *brittle*.

Order of attraction in the moiſt way, *Muriatic*, *Sebacic*, *Oxalic*, *Sulphuric*, *Saccho-lactic*, *Phoſphoric*, *Nitric*, *Arſenic*, *Fluoric*, *Tartareous*, *Citric*, *Formic*, *Lactic*, *Acetous*, *Succinic*, *Pruſſic*, and *Carbonic Acids*, *Ammonia*; in the dry way, *Lead*, *Copper*, *Quick-ſilver*, *Biſmuth*, *Tin*, *Gold*, *Antimony*, *Iron*, *Manganeſe*, *Zinc*, *Arſenic*, *Nickel*, *Platina*, *Sulphuret* of *Potaſh*, *Sulphur*.

Uſed in the conſtruction of various *Utenſils*; in the compoſition of *Bell-metal*; in *Silvering*, *Enamelling*, *Soldering*, *Dying*, *Medicine*, &c.

Of *Quickſilver.*

Found chiefly either in a *Native State*; or alloyed with ſilver, *Native Amalgam;* or in union with muriatic and ſulphuric acids, *Horn Mercury;* or minerallisſed by ſulphur, *Native Cinnabar.*

Manner of obtaining it from its ores, and of aſcertaining its purity. Freed moſt effectually from foreign admixture by cautious diſtillation.

When pure, of a *ſilver white* colour, *brilliant, fluid* at a common temperature, ſpecific gravity 13.568.

Congeals at 39 below 0 *Farenh.* and then found to be malleable.

In its liquid form attracts moiſture on expoſure to the atmoſphere, loſes its ſplendor and contracts a grey pellicle. By agitation with acceſs of air or trituration with mucilage or other tenaceous ſubſtances, is converted into a *greyiſh* or *black Oxyd:* hence the more common preparations of quickſilver, viz. *Pilul, Hydrarg,* P. L. *Unguent. Hydrarg.* P. L. *Emplaſt. Litharg.* cum *Hydrarg.* P. L. &c.

Paſſes from its liquid ſtate into that of vapor in vacuo even at a common temperature; but under atmoſpherical preſſure, requires to be heated to 600 *Farenh.*

If continued under expoſure to air at this temperature, is converted into a ſparkling *red Oxyd*, containing a larger proportion of *Oxygen* than that obtained by trituration, (*Hydrarg. Calcinat.* P. L.) Of the chemical properties of this oxyd.—When expoſed to a red heat in cloſe veſſels it is decompoſed, yielding pure *Oxygen Gas*, and the original *Metal.*

Quickſilver acts either directly or indirectly on all the *Acids.*

Partially decompoſes and combines with the *Sulphuric Acid* by the aſſiſtance of heat. Produces with it a white ponderous ſaline maſs, which on the affuſion of boiling water aſſumes a *lemon yellow* colour, (*Hydrarg. Vitriolat.* P. L.) The change of colour thought to depend upon the abſtraction of a portion of the undecompoſed acid.

Diſſolves in the *Nitric Acid* more or leſs readily, and with a more or leſs copious evolution of *Nitrous Gas*, according to the temperature and ſtrength or dilution of the acid, *Nitrate of Quickſilver.*—This expoſed to a low red heat, by a further and more complete decompoſition of the acid, yields a red *Oxyd*, (*Hydrarg.*

Hydrarg. Nitrat. Rubr. P. L.) Analogous in all its properties to the *Hydrarg. Calcinat.* or common *Oxyd.*

Has no action on the common *muriatic acid*, unleſs previouſly oxydated; but with the *Oxygeniſed Acid* combines with great facility and without effervefcence: hence the preparation of *Muriate of Quick-ſilver*, (*Hydrarg. Muriat.* P. L.) and of *mild Muriate of Quickſilver.* (*Hydrarg. Muriat. Mit.* P. L.).—

Of the proceſſes employed for obtaining theſe as well in the moiſt as in the dry way—Proofs that their difference conſiſts in the quick-ſilver being in the one ſo much more *oxydated* than in the other.

Of the combination of *Oxyd* of quick-ſilver with the *Acetic* and other *Acids*. (*Hydrarg. Acetat.* &c.)

The acid ſolutions of this, like thoſe of other *Metals*, decompoſed by *Alkalies* and *Alkaline Sulphurets*, and by moſt of the *Earths*. The degree of previous *Oxydation* indicated by the colour of the reſulting precipitates: thoſe by *Potaſh* and *Soda* are of a yellow or reddiſh brown; thoſe by *Ammonia* of a grey or white colour; (*Hydrarg. Præcipit. Alb.* P. L.) *Ammoniacal Muriate of Quickſilver*, FOURCROY.

Zinc, *Iron* and *Copper* precipitate *Quick-ſilver* from its ſolutions in its *metallic* form; a ſimilar effect produced, though ſlowly, by *Phoſphorus.*—*Alcohol*, added to the ſolution of *Nitrate of Quick-ſilver*, and aſſiſted by heat, furniſhes a precipitate, which when dried and heated, explodes with great violence, *Howard's Fulminating Mercury.*

Quick-ſilver amalgamates with moſt other *Metals*; very readily with *Gold*, *Silver*, *Lead*, *Tin*, *Zinc* and *Biſmuth*; leſs eaſily with *Platina*, *Copper* and *Arſenic*, and difficultly, if at all, with *Iron.*

Combines by different *Modes* and, as was ſuppoſed, under different degrees of *Oxydation*, with *Sulphur.* By fuſion and ſubſequent trituration, or by trituration ſimply, into a ponderous black powder (*Hydrarg. cum Sulph.* P. L.), Œ*thiop's Mineral*; and by fuſion and ſublimation into a red ſtriated maſs (*Hydrarg. Sulph. Ruber*, P. L.), *Vermillion. Artificial Cinnabar.* Which may alſo be prepared by double decompoſition, from a mixture of *Muriate of Quickſilver* and *Sulphuret of Antimony*, *Cinnabar Antimonii.*

Preparations analogous to the former procurable, by agitating *Quick-ſilver* in ſolutions of *Alkaline Sulphurets.*

Order of attraction in the moiſt way, *Sebacic, Muriatic, Oxalic, Succinic, Arſenic, Phoſphoric, Saccho-lactic, Tartareous, Citric, Nitric, Fluoric, Acetous, Boracic,* and *Carbonic Acids;* in the dry way, *Gold, Silver, Platina, Lead, Tin, Zinc, Biſmuth, Copper, Antimony, Arſenic, Iron, Alkaline Sulphurets, Sulphur.*

Uſes, in the conſtruction of *Philoſophical Inſtruments* and *Mirrors,* in *Gilding,* in working the *Ores of Gold and Silver,* making *Anatomical Injections,* and in *Medicine* in all the foregoing forms.

Of Lead.

Found 1ſt. (though very rarely,) *Native;* 2d. in union with ſulphuric acid, *Native Sulphate of Lead;* 3d. with acid or oxyd of arſenic, *Arſenical Lead Ores;* 4th. with phoſphoric acid, *Native Phoſphate of Lead;* 5th. with molybdic acid, carbonate of lime and ſilex, *Carinthian*

Molybdate of Lead; 6th. with chromic acid, *Red Lead Ore of Siberia;* 7th. with carbonic acid, *Sparry Lead Ore;* 8th. with ſulphur and a little ſilver, *Potter's Lead Ore, or Galena;* 9th. with antimony and a little ſilver, *Antimonial Lead Ore.*

Manner of extracting it from its *Ores.*

Colour, blueiſh white—*luſtre*, conſiderable—*ſoft*—*flexible*—*inelaſtic*—of little *tenacity*—not *ſonorous*—*Spec. Grav.* 11.352—more *malleable* than *ductile*—does not become *harder* or of greater *Denſity* by compreſſion—emits a particular *Smell* on friction.

Loſes its luſtre readily on expoſure to *Air*, becoming firſt of a dull *grey* colour, and afterwards *whitiſh.*

Melts at 540 *Farenh.* and if cooled ſlowly cryſtalliſes into quadrangular pyramids. Heated more intenſely, it boils and emits fumes; if under expoſure to air, it paſſes readily into a ſtate of *Oxyd*, and aſſumes different colours, according to the degree of oxydation: hence *Maſſicot*, *Minium* and *Litharge.* Theſe and all the other oxyds of lead eaſily vitrified, *Glaſs of Lead;* and this eaſily decompoſed, if heated, with the addition of *Charcoal.*

Lead in its metallic ſtate little affected, either by the *Sulphuric* or *Muriatic Acid*, but diſſolves readily in the diluted *Nitric Acid*, and forms with it a cryſtallizable ſalt.

Expoſed to the vapour of the *Acetous Acid*, it is converted into a laminated white oxyd, *Flake White* (*Ceruſs A.* P. L), which, diſſolved in a further portion of this acid, produces a cryſtallizable aſtringent ſalt, remarkable for its ſweetneſs, *Sugar of Lead*, (*Ceruſs. Acetat*. P. L.). (*Aq. Litharg. Acetat.* P. L.).

When highly oxydated, as by treatment of its red oxyd by *Nitric* or *Oxy-muriatic Acid*, forms a *brown* precipitate, which enflames without detonation when ſtrongly triturated with *Sulphur*.

Is precipitated from its ſolutions of a *white* colour by *Alkalies* and by *Earths*, and of a *dark brown* by *Alkaline Sulphurets* and *Sulph. Hydrog. Gas*. Its ſolutions alſo decompoſed by the *Sulphuric*, *Muriatic* and *Phoſphoric Acids*, and their compounds.

May be oxydated by deflagration with *Nitre*, and by fuſion with the *Fixed Alkalies* becomes ſoluble in water.

Unites by fuſion with moſt of the metals, viz. with *Platina*, *Gold*, *Silver*, *Copper*, *Tin*, *Biſmuth*, &c. Amalgamates readily with *Quick-ſilver*, but refuſes to combine with *Iron.*

Melts with *Sulphur* into a grey coloured brittle compound, leſs fuſible than itſelf, *Artificial Galena;* with *Phoſphorus* into one which is malleable, but more diſpoſed to tarniſh.

The *Oxyds* of *Lead* ſoluble in *Expreſſed Oils* and *Animal Fats:* hence the preparation of certain *Plaſters*, *Varniſhes* and *Paints;* are capable alſo of decompoſing ſeveral of the compounded *Salts*, (*Patent Yellow*); and remarkably promote the vitrification of earthy bodies and other metallic oxyds, as in *Glaſs-making*, and in the *Refinement of Gold and Silver.*

Order of attraction in the moiſt way, *Sulphuric*, *Sebacic*, *Saccho-lactic*, *Oxalic*, *Arſenic*, *Tartareous*, *Phoſphoric*, *Muriatic*, *Nitric*, *Fluoric*, *Citric*, *Formic*, *Lactic*, *Acetous*, *Boracic*, *Pruſſic and Carbonic Acid*, *Potaſh;* in the dry way, *Gold*, *Silver*, *Copper*, *Quick-ſilver*, *Biſmuth*, *Tin*, *Antimony*, *Platina*, *Arſenic*, *Zinc*, *Nickel*, *Iron*, *Alkaline Sulphurets*, *Sulphur.*

Employed in *Medicine*, and very extenſively in the *Arts*, particularly in the conſtruction of

Buildings, and different *Utenſils;* in the making of *Shot*, in *Statuary*, *Glaſs-making*, *Glazing*, *Painting*, *Varniſhing*, *Refinement of Gold* and *Silver*, *Compoſition of Pewter*, and *Plumber's Solder*, &c. &c.

Of Copper.

Found 1ſt *Native;* 2d. combined with oxygen and ſometimes with iron, *Tile Ore*, *Pitch Copper Ore;* 3d. with carbonic acid, *Green* and *Azure Copper Ores;* 4th. with arſenic acid, *Arſeniate of Copper;* 5th. with ſulphuric acid, *Sulphate of Copper;* 6th. with muriatic acid, *Muriate of Copper;* 7th. with ſulphur, *Vitreous Copper Ore;* 8th. with ſulphur and iron, *Yellow Copper Ore;* 9th. with arſenic and iron, *White Copper Ore;* and 10th. with lead, antimony, iron, ſulphur, alumine, ſilex and ſilver, *Grey Copper Ore.*

Manner of *extracting* it from its ores, and of *purifying* it.

Colour, bright browniſh red—*taſte*, nauſeous ſtyptic—*odour*, when rubbed diſagreeable—*hardneſs*,

hardneſs, ſomewhat greater than that of *Gold* or *Silver*—*Malleability*, *Ductility* and *Tenacity* conſiderable—*Sp. Gr.* if ſoft 7.788, if compreſſed nearly 9—when hard, *elaſtic* and *ſonorous.*

On expoſure to *Air* loſes its luſtre and contracts a greeniſh ruſt: in the *open Fire* is converted into a dull browniſh red or black *Oxyd*, which heated to redneſs with *Filings* of *Copper*, aſſumes an orange colour.

Fuſes at 27° *Wedw.*=4587 *Farenh.* and if heated more intenſely is *volatiliſed* in fumes.—In cooling ſlowly *cryſtalliſes* into quadrilateral pyramids.

Is more or leſs acted on by all the *Acids.*

Diſſolves with the aſſiſtance of a boiling heat in concentrated *Sulphuric Acid*, and affords tranſparent oblong rhomboidal cryſtals of a deep *blue* colour, *Sulphate of Copper*, *Blue* or *Roman Vitriol (Cuprum Vitriolatum* P. L.)

Diſſolves in diluted *Nitric Acid* with effervеſcence and the production of *Nitrous Gas*, forming a deep *blue* ſolution, and by evaporation a deliqueſcent ſalt, which detonates on being ſuddenly heated *(Nitrate of Copper.)* The precipitate obtained from this ſolution by adding *Chalk*, forms a beautiful but fugitive pigment, *Blue-verditer*.

Is in its metallic ſtate ſlowly acted on by the *Muriatic Acid*, unleſs aſſiſted by heat: the ſolution, of a *graſs green* colour, on evaporation yields *cubical* cryſtals, whilſt a ſolution of the orange coloured oxyd before mentioned, yields colourleſs *octohedrons*, which are not affected by *Ammonia*, unleſs after expoſure to air.

Moiſtened with the *Acetous Acid*, under expoſure to air, corrodes into a *green* ſaline *oxyd*, *Verdegris of Commerce* (*Ærugo* P. L.), which by additional acid diſſolves, and yields a beautiful *dark green* tranſparent ſalt, *Diſtilled Vergedris*: both employed as pigments.

Eaſily attacked by the *Sebacic Acid* of rancid oil or fat, eſpecially if before in any degree *oxydated*.

Moſt of the ſaline preparations of *Copper*, particularly the *Nitrate* and *Muriate*, ſoluble in *Alcohol*, which then burns with a *green* flame.

Is more or leſs acted on by all the *Alkalies*. With *Ammonia* forms a beautiful *blue* ſolution, which diſappears on the excluſion and returns on the admiſſion of *Air*. *Ammonia* the moſt delicate teſt of the preſence of *Copper*, with the exception mentioned above.

Is precipitated of a fine *graſs green* colour from its ſolution in *Sulphuric Acid*, by *Arſeniate of Potaſh*, *Scheele's Green Pigment.*—Of a *blue* colour from the *Nitric Acid* by *Chalk*, as before mentioned, and in a *metallic* ſtate from all its ſolutions by *Zinc* and *Iron*, *Zement Copper.*

Detonates with melted *Nitre*, and by the aſſiſtance of heat decompoſes *Muriate of Ammonia.*

Unites by fuſion with many of the other *Metals*, forming very important compounds, as with *Platina* into one of great denſity and hardneſs; with *Gold*, *Standard Gold;* with *Silver*, *Standard Silver* and *Silver Solder;* with *Tin*, *Bronze* and *Bell-metal;* with *Arſenic*, *Tombac;* with *Zinc*, *Braſs* and *Manheim Gold*, and with *Antimony* a violet coloured alloy.

Combines alſo with *Sulphur* and *Phoſphorus* by fuſion. Is tarniſhed by immerſion in *hepatized Water.*

The *Oxyds* of *Copper* impart a *greeniſh* tinge to *Glaſs.*

Order of attraction in the moiſt way, *Oxalic*, *Tartareous*, *Muriatic*, *Sulphuric*, *Saccho-lactic*, *Nitric*, *Sebacic*, *Arſenic*, *Phoſphoric*, *Succinic*, *Fluoric*, *Citric*, *Formic*, *Lactic*, *Acetous*, *Boracic*, *Pruſſic* and *Carbonic Acids*, *Potaſh*, *Soda*, *Ammonia*, *Unctuous Oils*; in the dry way, *Gold*, *Silver*, *Arſenic*, *Iron*, *Manganeſe*, *Zinc*, *Antimony*, *Platina*, *Tin*, *Lead*, *Nickel*, *Biſmuth*, *Cobalt*, *Quick-ſilver*, *Alkaline Sulphurets*, *Sulphur*, *Phoſphorus*.

Uſe very extenſive, being employed in the conſtruction of *Buildings* and *Coppering of Ships*; in the formation of various *Culinary* or other *Utenſils*, in *Bell* and *Cannon Founding*, in *Coinage*, in *Enamelling*, *Dying*, *Painting* and *Medicine*.

Of Iron.

Of all metals the moſt frequently and abundantly met with, and generally in the following forms; 1ſt. *Native*; 2d. in ſtate of grey oxyd, *Grey Iron Ore*; 3d. united with carbonic acid, *Hæmatite*; 4th. with carbonic acid, alumine, and often phoſphoric acid, *Argillaceous Iron Ore*; 5th. with carbonate of lime and oxyd of manganeſe, *Spathoſe Iron Ore*; 6th. with ſulphuric acid, *Native Sulphate of Iron*; 7th. with chromic acid, alumine and ſilex, *Native Chromate of Iron*; 8th. with ſulphur, with arſenic, or with both, *Iron Pyrites*, *Miſpickel*, *Arſenical Pyrites.*

As obtained from its ores by the uſual proceſs of reduction, forms a fuſible maſs, of a bluiſh grey colour and coarſe granular fracture, *Crude* or *Caſt Iron*, which freed from its impurities by continued expoſure to a ſtrong heat and ſubſequent hammering and roling, loſes its brittleneſs, becomes of a lamellar or fibrous texture, and capable, when red hot, of having ſeveral portions welded by compreſſion into a continuous maſs, *Bar* or *Forged Iron.*

This, by cementation or fuſion with *charcoal*, acquires weight, becomes again fuſible, brittle when cold, of a cloſe granular texture, ſuſceptible of a high poliſh, very elaſtic and capable of taking on a great degree of hardneſs if heated and ſuddenly cooled, *Common* and *Caſt Steel.*

Of the difference of theſe three ſtates and manner of diſtinguiſhing them.

Bar Iron the pureſt. Colour of this *bluiſh grey*, when poliſhed very *ſplendid*—has a ſlightly ſubacid taſte, and when rubbed, a ſenſible *odour*—*harder* than moſt other metals—more *tenacious* than any—conſiderably more *ductile* than *malleable;* Sp. Gr. from 7.600 to 8.166.

Iron the only metal obedient to the *Magnet.*

Suſceptible of different degrees of *Oxydation.* Is ſpeedily converted into a yellowiſh or reddiſh brown ruſt on expoſure to air and moiſture, (*Rubigo Ferri* P. L.), and ſtill more ſpeedily into a dark grey oxyd, by combuſtion in *Oxygen Gas*, digeſtion in warm *Water*, or the application of its vapour to it under ignition.

Diſſolves more or leſs readily in all the *Acids.* Its ſolution generally accompanied with the evolution of *Hydrogen Gas*, and the reſulting compounds poſſeſſing different properties according to its degree of *Oxydation.*

Requires the aid of heat to decompoſe *Concentrated Sulphuric Acid*, but diſſolves readily in it when when *diluted*, and yields a pale green cryſtallizable ſalt, *Sulphate of Iron*, *Martial Vitriol* (*Ferrum vitriolatum* P. L.). A leſs pure ſalt obtained by the decompoſition of Iron Pyrites, *Copperas of Commerce.*

Rapidly decompoſes the *Nitric Acid*, by which, unleſs in a diluted ſtate, it is rather *oxydated* than *diſſolved.*

Diſſolves readily in the *Muriatic Acid*, and produces a yellowiſh brown ſolution, miſcible with ſpirits of wine (*Tinctura Ferri Muriati* P. L.).

Soluble by digeſtion in the *Acetous Acid*, hence the chalybeate properties communicated by it to the different kinds of wine, (*Vinum Ferri*, P. L.)

Unites alſo eaſily with Acid of Tartar (*Ferrum Tartariſatum* P. L.)

With *Pruſſic Acid* forms *Pruſſian Blue*: Pruſſiate of Potaſh or of Lime therefore employed as teſts for aſcertaining its preſence.

In combination with *Carbonic Acid* becomes ſoluble in water; hence the properties of *Chalybeate Springs*.

With *Gallic Acid* produces a black precipitate, the baſis of common *Ink*.

Precipitates ſpontaneouſly in the form of ochre from moſt of its acid ſolutions on expoſure to *Air*. When thrown down from theſe by an *Alkali*, may be re-diſſolved by the addition of a further portion of it, *Alkaline martial Tincture of Stahl*.

Combines with the *Fixed Alkalies* by fuſion.

Deflagrates with *Nitrate of Potaſh*; and ſublimes

Zinc. Texture, *laminated. Very brittle.* Sp. Gr. from 6.702 to 6.860. Simply loſes its luſtre on expoſure to the *Air;* and is not altered by *Water* unleſs expoſed to it when red hot.

Melts ſoon after ignition; on cooling *crystallizes* into octohedrons; is *volatile* in cloſe veſſels. When heated in contact with *Air* is converted into a light *white Oxyd*, (*Argentine Flowers of Antimony*,) which are ſoluble in water, and fuſible into an *Hyacinthine Glaſs;* in cloſe veſſels by parting with different portions of oxygen, they acquire a *brown*, *orange*, or *yellow* colour.

Decompoſes both the *Sulphuric* and *Nitric Acids*, the former with, the latter without, the aſſiſtance of heat. Requires long digeſtion for its ſolution in the *Muriatic Acid;* but in the *Oxy-muriatic* diſſolves with great facility.

Precipitable from the latter by Zinc or Iron in the form of a *black Oxyd*, which when dried by a gentle heat *takes fire* ſpontaneouſly in the air, and is converted into *white Oxyd.*

Decompoſes, in the dry way, moſt of the ſaline *Compounds* of the *Sulphuric Acid.* Detonates readily with *Nitre;* and decompoſes *Muriate of Quickſilver.*

Combines with moſt other *Metals*, and renders them *brittle*. Said more than any other metal to diminiſh the *Magnetic* property of *Iron*.

Unites with *Sulphur* in all proportions, and forms with it a *grey ſtriated* compound, *Antimony* of the ſhops.

This when expoſed for a continuance to a low heat, yields a *grey Oxyd*, which by fuſion is converted into a *yellowiſh Glaſs* (*Vitrum Antimonii* P. E.); this levigated and mixed with melted wax forms the *Vitrum Antimonii Ceratum*.

Roaſted with *Hartſhorn* and afterwards ignited, yields a *white Powder*, (*Pulvis Antimonialis* P. L. *Antimonium Calcareo-Phoſphoratum* P. E.)—When deflagrated with *Nitre*, is more or leſs decompoſed according to the degree of combuſtion (*Antimonium Calcinatum* P. L. *Antimonium Uſtum cum Nitro* P. E. *Crocus Antimonii* P. L. and P. E.)

Nature of theſe preparations.

Reduced to powder and boiled in a ſolution of *Potaſh*, depoſits, on cooling, an *orange* coloured precipitate (*Kermes Mineralis* Ph. Suec.); on the addition of the Sulphuric Acid to the ſolution whilſt hot, a *browniſh red* precipitate, (*Sulphur Antimonii præcipitatum* P. L. and P. E.) Theſe *Hydro-ſulphurated Oxyds of Antimony.*

A mixture of *Sulphuret of Antimony* and *Muriate of Quickſilver* or of *Crocus of Antimony* and *common Salt*, with the addition of *Sulphuric Acid*, produces, by diſtillation, a butyraceous compound (*Antimonium Muriatum* P. L. and P. E.), which on the affuſion of common water, or by the addition of Potaſh, furniſhes a *white Oxyd, Powder of Algaroth.* The combination of this with acidulous Tartrite of Potaſh, forms a triple ſalt (*Antimonium Tartariſatum* P. E.)

A ſimilar preparation obtained from *Glaſs* or *Crocus of Antimony* (*Antimonium Tartariſatum* P. L.), which are alſo ſoluble in different kinds of Wine (*Vinum Antimonii* P. L.)

Order of attraction in the moiſt way, *Sebacic Acid*, *Muriatic*, *Oxalic*, *Sulphuric*, *Nitric*, *Tartareous*, *Saccho-lactic*, *Phoſphoric*, *Citric*, *Succinic*, *Fluoric*, *Arſenic*, *Formic*, *Lactic*, *Acetous*, *Boracic*, *Pruſſic* and *Carbonic;* in the dry way, *Iron*, *Copper*, *Tin*, *Lead*, *Nickel*, *Silver*, *Biſmuth*, *Zinc*, *Gold*, *Platina*, *Quickſilver*, *Arſenic*, *Cobalt*, *Alkaline Sulphurets*, *Sulphur.*

Uſed in the compoſition of *Printer's Types*, and of *Nails for Coppering Ships*, in *Medicine*, &c.

Of Manganeſe.

Found 1ſt. *Native;* 2d. in union with Oxygen, *Native Oxyd;* and 3d. with Oxygen, Silex, Iron, and Alumine, *Siliceous Manganeſe.*—Said alſo to be contained in the aſhes of moſt *Vegetables.*

Colour *dull* or *greyiſh white.* Texture, *granular.* Sp. Gr. from 6.850 to 7. Hardneſs next to *Iron. Very brittle.*

Next to Platina difficult to fuſe; but *oxydates* more eaſily than any other metal: its *Oxyd* of different colours, *white, red* and *black.*

Soluble in the diluted *Sulphuric,* in the *Nitric, Muriatic* and ſeveral other acids.

In the ſtate of *Oxyd,* occaſions in the *Muriatic Acid* a ſtriking change of properties, by imparting to it a portion of its *Oxygen.*

Its action on the *Alkalies* not yet aſcertained.

When oxydated, decompoſes both *Nitrate of Potaſh* and *Muriate of Ammonia,* in the dry way.

In this ſtate unites by fuſion with the *Earthy Bodies,* and when added to *Glaſs,* either renders it *colourleſs* or communicates a *violet* tinge, according to the degree of *Oxydation.*

Unites alſo, by fuſion, with *Sulphur*, into a *yellowiſh-green* maſs. By mixture with unctuous ſubſtances ſometimes occaſions *Inflammation*.

Combines in the metallic ſtate with moſt of the other *Metals*, rendering *Gold* and *Iron* more fuſible, *Copper* leſs.

Order of attraction in the moiſt way, *Oxalic Acid*, *Citric*, *Phoſphoric*, *Tartareous*, *Fluoric*, *Muriatic*, *Sulphuric*, *Nitric*, *Saccho-lactic*, *Succinic*, *Sebacic*, *Arſenic*, *Formic*, *Lactic*, *Acetous*, *Pruſſic* and *Carbonic ;* in the dry way, *Copper*, *Iron*, *Gold*, *Silver*, *Tin*, *Alkaline Sulphurets*.

Employed principally in *Glaſs-making* and *Bleaching*.

Of Tungſten or *Wolfram.*

Found, 1ſt, in an *acid* form in combination with Lime, *Tungſtate of Lime ;* and 2d. with Oxyd of Mangancſe and of Iron, Silex, and Tin, *Wolfram*.

Colour *ſteel grey*. Texture *granular*. *Extremely hard*. Sp. Gr. 17.6.

Nearly *infuſible*, requiring a heat at leaſt equal to 170° *Wedg*.

Yields a yellow *Oxyd*, (*Acid of Tungſten*,) which in cloſe veſſels becomes *blue* or *black*.

Inſoluble in the *Sulphuric*, *Nitric*, and *Muriatic Acids*. Slightly ſoluble in the *Oxy-Muriatic*.

Combines with the other *Metals*. Does not leſſen the ductility of *Silver* or *Copper;* but renders *Iron*, *Tin*, *Biſmuth*, *Antimony*, and *Manganeſe* harder.

Order of Attraction in the moiſt way, *Lime*, *Potaſh*, *Ammonia;* in the dry way, *Potaſh*, *Lime*, *Iron*, *Manganeſe*.

Not as yet applied to any uſe.

Of Uranium.

Found, 1ſt, in combination with Sulphur, *Pechblende;* 2d. with *Oxygen*, (on the ſurface of the former) *Yellow Oxyd;* and 3d. with Carbonic Acid and a little Copper, *Calcolite*.

Has been but imperfectly reduced.

Appears capable of uniting with ſeveral of the *Acids*.

Its *Oxyds* tinge glaſs of various colours, *brown*, *grey*, and *green*.

Of Molybdena.

Found in combination with Sulphur, *Molybdena*, formerly confounded with *Plumbago.*

Hitherto obtained only in *agglutinated grains.*

Colour, externally *whitiſh yellow*, internally *grey.* Sp. Gr. 7.5. *Brittle.*

Leſs fuſible than either *Platina* or *Manganeſe.*

According to the experiments of *Mr. Hatchett*, is capable of combining with four different portions of *Oxygen*, producing a *black*, a *blue*, a *green Oxyd*, (*Molybdous Acid*,) and a *yellow* or *white* (*Molybdic Acid.*)

When combined with *Iron*, *Copper* and *Silver*, renders them friable.

In union with *Sulphur* regenerates *Sulphuret of Molybdena.*

Order of Attraction unknown.

Not yet applied to any uſe.

Of Titanium.

Found combined with *Oxygen* in the *Red Schorl* of *Hungary*; and in *Manachanite.*

Of a colour ſomewhat reſembling *Copper.* Appears to be *infuſible*, but capable of being *volatilized.*

Difficultly *oxydated* by any of the acids.

With *Iron* forms a compound of a gold colour internally.

Of Tellurium.

Found in ſeveral of the *Ores of Gold;* and in conſiderable proportion.

Of a *whitiſh-leaden* colour; *metallic luſtre*; *laminated* texture; *very brittle;* Sp. Gr. 6.115.

Of all metallic ſubſtances the *moſt fuſible* except *Quickſilver*, like which it may be *ſublimed* in brilliant globules.

Burns with a *bluiſh-green* flame. Soluble in the *Nitric*, *Muriatic*, and *Sulphuric Acids;* from which it may be precipitated by *Alkaline Sulphurets* in the form of a powder, in appearance much reſembling *Kermes Mineral.*

Said to be the only metal, except *Gold*, *Platina* and *Antimony*, which is not precipitated from its ſolutions by *Pruſſian Alkali.*

Its *Oxyds* ſo rapidly reduced on heated *Charcoal* as to occaſion actual *detonation.*

Of Chrome.

Found 1ſt, in an *Acid* form combined with Oxyd of Lead, *Red Lead of Siberia;* and in a ſimilar acid form in the *pale red Ruby;* 2d. with Oxygen, in the *green Emerald of Peru.*

May be obtained in a *concrete acid* ſtate, and of a red colour, from the two firſt, by treatment with *Carbonate* of *Potaſh;* or in the form of a *green Oxyd* from the laſt by treatment with *Muriatic Acid.*

Has as yet been but imperfectly reduced.

Of a *greyiſh white* colour; *very hard; very brittle;* and *very difficult* of *fuſion.*

Not ſoluble in the *Muriatic* or *Sulphuric Acids;* and difficultly in the *Nitric* and *Oxymuriatic.*

Combined, in its *Acid* ſtate, with *Muriatic Acid*, is capable of diſſolving *Gold.*

Of

Of Columbium.

Lately diſcovered in an *Acid ſtate* by *Mr. Hatchett*, in a dark grey mineral, ſent with ſome iron ore from *America*, and which appears to conſiſt of more than three-fourths of this acid combined with iron. Its colour in this ſtate is *white*; it *reddens* litmus paper; is inſoluble in boiling *Nitric Acid*, but ſoluble in *Sulphuric Acid* when ſtrongly heated, and alſo, when recently ſeparated from Potaſh, in boiling *Muriatic Acid.*

It gives colourleſs ſolutions with *Acids* and *Alkalies*; is precipitated from its acid ſolutions by Alkalies in *white flocculi*, by Pruſſiate of Potaſh of an *olive green colour*, and by Tincture of Galls of a *deep orange.*

Is extremely difficult of reduction.

OF COMBUSTIBLE SUBSTANCES.

The ſubſtances uſually denominated *Combuſtible*, are ſuch as are more eſpecially remarkable for exhibiting the phenomenon of *Combuſtion*, when heated to a certain degree in contact with *Air*.

The changes produced on the *Air* in this proceſs, and the alteration which the *inflammable Subſtances* themſelves undergo, already particularly treated of.

In their *Form*, *Conſiſtence*, *Weight*, *Volatility*, &c. the ſubſtances of this claſs differ widely from each other. They are comparatively *lighter* than moſt other bodies.

May be divided into two claſſes—*Simple* and *Compounded*.

The ſimple combuſtibles are, *Hydrogen*, *Carbon*, *Sulphur* and *Phoſphorus*.

Hydrogen.

Already treated of under *Aeriform fluids*.

Carbon.

Obtained in its common form, *Charcoal,* from vegetable, animal and bituminous ſubſtances by expoſure to heat in cloſe veſſels.

Varies in its form, quantity, and purity, according to the nature of the ſubſtance from which it is prepared.

The charcoal of common wood, *black*, *light*, *brittle*, *ſonorous*, *inſipid*, *inodorous*, and of great *durability*.

Capable of ſuſtaining the moſt intenſe degrees of *Heat* in cloſe veſſels, without alteration; but upon acceſs of *Air*, burns with a white flame, and yields *Carbonic Acid Gas*, leaving behind a ſmall quantity of *earthy ſaline Aſhes*.

Decompoſes the *Sulphuric Acid* and all its compounds, by the aſſiſtance of *Heat*.

Decompoſes alſo the *Nitric Acid* without *Heat*, and ſometimes with ſuch rapidity as to occaſion *Combuſtion*. Detonates with *Nitre*.

Diſſolves, by fuſion, in the *fixed Alkalies*; very readily alſo in *Alkaline Sulphurets*.

Combines by cementation with *Iron* either in a ſmall proportion, *Steel*, or in a larger, *Plumbago*.

Of the properties and uſes of *Native Plumbago*.

Charcoal remarkable for correcting *Fœtor*, and depriving many ſubſtances of *Colour*, eſpecially when uſed in its freſh-burnt ſtate.

Exiſts in its pureſt form in the *Diamond*, which for its complete combuſtion requires more oxygen than charcoal, and produces a larger portion of *Carbonic Acid Gas*.

Uſed chiefly as an article of *Fuel*, and in certain arts, trades, and manufactures.

Of Sulphur.

Found either uncombined, as depoſited by water, or ſublimed by ſubterranean fire, *Native Sulphur*; or in combination with other bodies, more eſpecially with different *Metals*.

May be obtained artificially by the decompoſition of *Sulphuric Acid*.

Colour, *pale yellow*.—Sp. Gr. 2.033.—*Hard, brittle, inſipid, inſoluble*.—Very eaſily melted.—

Sublimes in cloſe veſſels into *light yellow* flowers, (*Flores Sulphuris* P. L.)

Burns with a *blue* flame, and by abſorbing *Oxygen* from the Air, is converted into *Sulphureous Acid Gas*, *Sulphureous* or *Sulphuric Acid*, according to the proportion of this principle.—Similar effects are produced on it by deflagration with *Nitre*.

Is little affected by *Acids*.

Unites readily with the *Alkalies*, and alſo with the *ſaline Earths*, producing liver-coloured compounds (*Sulphuret of Potaſh*, &c.) which are ſoluble in *Water*, and may be decompoſed by all the *Acids* (*Sulphur præcipitatum* P. L.

When intimately mixed with certain proportions of *Potaſh* and *Nitre*, produces a compound which when gradually expoſed to heat explodes with great violence (*Pulvis fulminans*).

With *Nitre* and *Charcoal*, in mixture, it conſtitutes *common Gunpowder*.

Combines by fuſion with all the metals except *Platina*, *Gold*, and *Zinc*.

Is inſoluble in *Spirit of Wine*, but unites with *oily* matter of every kind, and with all the liquid *bituminous* bodies, into compounds of increaſed conſiſtence (*Balſams of Sulphur*).

Order of attraction in the moiſt way, *Lead, Tin, Silver, Quickſilver, Arſenic, Antimony, Iron, Potaſh, Ammonia, Baryt, Lime, Magneſia, Unctuous Oils, Eſſential Oils, Æther, Spirit;* in the dry way, *Potaſh, Soda, Iron, Copper, Tin, Lead, Silver, Cobalt, Nickel, Biſmuth, Antimony, Quickſilver, Arſenic.*

Employed principally in *Bleaching*, in the manufacture of *Sulphuric Acid*, and of *Gunpowder*, frequently alſo in *Medicine.*

Of Phoſphorus.

Obtained, by decompoſing calcined *Bones* by means of diluted *Sulphuric Acid*, evaporating the ſupernatant liquor to the conſiſtence of a ſyrup, mixing it with powdered *Charcoal*, and diſtilling in the open fire; or by adding *Nitrate* or *Acetite* of *Lead* to common *Urine*, collecting the precipitate, mixing this with *Charcoal* and diſtilling as above.

Purified by cautious re-diſtillation, or ſtraining it, when melted, through leather.

Colour *pearly-white. Semitranſparent. Waxy. Inſoluble* in *Water.* Very *fuſible.*

When expoſed to air, at a low temperature, emits a white fume, and is luminous in the dark; if heated, burns with great rapidity; and in both caſes acquires acid properties, *Phoſphoric Acid.*

Decompoſes the *Nitric Acid*, occaſioning combuſtion by the ſudden ſeparation of its *Oxygen.*

By treatment with the *fixed Alkalies* or *Lime*, yields a permanently elaſtic fluid, which explodes on admiſſion of *Air* (*Phoſphoric Gas.*)

Diſſolves in *Eſſential* and *Unctuous Oils*, *Spirit* of *Wine*, and *Æthers.*

Unites by fuſion with *Sulphur.*

Unites alſo with ſeveral of the *Metals*, and decompoſes moſt of their *Oxyds.*

Uſed in the preparation of *liquid Phoſphorus*, *Phoſphoric Matches*, and portable *Phoſphoric Bottles.* Attempts have alſo been made to employ it medicinally in ſmall doſes.

Compound Combuſtibles.

Found abundantly in the vegetable, animal, and mineral departments; ſome prepared artificially.

Conſiſt principally of *Hydrogen* and *Carbon* variouſly combined.

May be divided into five kinds, *Alcohol* and *Æther*, *Fixed Oils*, *Volatile* or *Eſſential Oils* and *Reſins*, *Bitumen*.

Of Alcohol.

Obtained from ſuch organiſed ſubſtances, or their products, as have undergone the *Vinous Fermentation*, of which thoſe containing *ſaccharine Matter* are alone ſuſceptible.

This proceſs materially influenced by *Reſt*, *Dilution*, *Temperature*, and *Expoſure to Air*. —Diviſible into different ſtages, the *vinous* productive of Alcohol, the *acetous* affording Vinegar, and the *putrid* generating Ammonia.

Theſe changes promoted or retarded by various means, *Ferments*.

Repeated diſtillation and digeſtion on dried *Muriate of Lime* or on *Potaſh*, neceſſary to bring *Alcohol* to its utmoſt degree of purity.

When pure *colourleſs* and *tranſparent*.

Taſte *hot* and *pungent*. Sp. Gr. 0.815.

Miſcible with *Water* in all proportions.

Burns with a bluiſh flame, producing in combuſtion *Carbonic Acid Gas* and *Water*.

Undergoes ſingular changes in its properties by treatment with the different *Acids;* hence the preparation of *Æthers*, *Oleum Vini*, &c.

Diſſolves the *Alkalies*, and many of the *compounded neutral Salts*, particularly ſuch as are deliqueſcent. Alſo diſſolves *Soap*, and acts readily as a ſolvent on *Eſſential Oils* and *Reſins*, on *Balſams* and on *Camphor;* hence the preparation of various *Spirituous Liquors*, *Tinctures*, *Varniſhes*, &c.

Conſidered by *Mr. Lavoiſier* and others, as a compound of *Hydrogen*, *Carbon*, and *Oxygen*, produced by the decompoſition of the ſugar, in the act of *Fermentation*.

Order of Attraction, *Water*, *Æther*, *Eſſential Oils*, *Ammonia*, *Potaſh*, *Alkaline Sulphurets*, *Sulphur*.

In general uſe for various *technical* as well as *dietetical* and *medical* purpoſes.

Of Fixed Oils.

Obtained both from *Vegetables* and *Animals.*

From the *former* ſometimes by boiling, but moſtly by preſſure, from certain *Fruits*, *Kernels*, and *Seeds*, hence called *Expreſſed Oils;* called alſo *Unctuous Oils.*

From the adipoſe membrane of the *latter*, of different colours and conſiſtence according to the part, the age, and the ſpecies of animal from which it is taken, *Lard*, *Suet*, *Fiſh Oil.*

The difference between Animal and Vegetable Oils not exactly aſcertained. The Animal in diſtillation furniſh a peculiar acid, *Sebacic Acid.*

Both vary in the temperature at which they become *ſolid;* are inſoluble both in *Water* and *Alcohol;* become *rancid* by keeping; yield, by diſtillation in cloſe veſſels, an *acid Phlegm*, a lighter and a denſer *Oil*, (*Empyreumatic Oil*,) a large quantity of *Hydrogen Gas* mixed with *Carbonic Acid Gas*, and leave behind a ſmall proportion of *Charcoal.*

Afford *Water* and *Carbonic Acid Gas* by inflammation in contact with *Air.*

By mixture with the ſtronger *Acids*, produce, in ſome inſtances, *ſaponaceous Compounds;* in others occaſion *Combuſtion.*

Unite more perfectly with the *Alkalies*, more eſpecially with *Potaſh* and *Soda;* with the latter, form common *Soap.*

Unite alſo into ſaponaceous compounds with *Baryt*, *Lime*, and *Magneſia.*

Have no action on any of the *Metals* except *Copper* and *Iron*, but aſſiſted by heat diſſolve moſt of the *metallic Oxyds*, and when ſeparated again from theſe, are found to be ſoluble in *Alcohol.*

Form with *Sulphur* a browniſh red fluid of a diſagreeable ſmell (*Balſamum Sulphuris* P. L.) Combine alſo by the aſſiſtance of heat, with moſt of the *Bituminous Bodies.*

Conſidered as differing principally from the *Volatile* or *Eſſential Oils*, in containing different portions of *Mucilage.*

Employed in *Painting*, *Varniſhing*, *Soap-making*, in *Mechanics*, for *Fuel*, in *Diet*, *Medicine*, &c.

Of Sperma-ceti.

Obtained from the brain of a particular ſpecies of whale, (*Cetus dentatus* Lin.) thence called the Sperma-ceti whale; obtained alſo in ſmall quantity from the oil of the ſame fiſh.

After refinement, *white*, *ſemitranſparent*, *cryſtalline*, *friable*, *inſipid*, *inodorous*.

Differs chiefly from the fixed oils in being little altered by diſtillation, and not eaſily acted upon by *Acids* or *Alkalies*.

Suppoſed to have the ſame relation to *Unctuous Oils* that *Camphor* has to the *Eſſential*.

Uſed chiefly for making *Sperma-ceti candles*, and in the compoſition of *Ointments*, *Plaiſters*, &c.

Of Bees-Wax.

Depoſited by the *Bee* in the conſtruction of the *Honey-comb*. Colour, *yellow*.

Very analagous to *Fixed Oils* in all its eſſential properties.

Becomes white on expoſure to *Air*, or treatment with the *Oxygenized Muriatic Acid.*

Forms the baſis of ſeveral *Cerates*, *Ointments*, and *Plaiſters.*

Employed alſo in ſeveral of the *Arts*, but principally in making *Wax candles.*

Of Volatile or Eſſential Oils.

Obtained from moſt fragrant vegetables by expreſſion, or diſtillation with Water.

Taſte *pungent*. Odour, colour, and conſiſtence, *various*. Moſt of them lighter, ſome heavier than *Water*.

Thicken and become leſs odorous by abſorbing *Oxygen* when expoſed to *Air*; hence the ſuppoſed formation of *Balſams* and *Reſins*, which differ chiefly in conſiſtence and the occaſional preſence of *Benzoic Acid.*

Alſo affected by expoſure to *Light.*

Sparingly ſoluble in *Water*; but readily ſo in *Alcohol.*

Volatile in cloſe veſſels, at or under the temperature of 212 *Farenh.* By repeated diſtillation loſe their characteriſtic properties, and are brought nearly to reſemble each other.

Highly inflammable when heated in contact with *Air.*

Decompoſe the ſtronger *Acids ;* in ſome inſtances with ſuch rapidity as to occaſion actual *Combuſtion.*

May be united with the *Alkalies* and *Lime* ſo as to form *Soaps.*

Combine intimately with *Sulphur.*

Combine alſo with *Phoſphorus, Unctuous Oils,* and *Camphor.*

Purity aſcertained by ſolution in *Spirit,* or expoſure to *Heat.*

Chiefly employed in *Medicine.*

Of Camphor.

Thought to be a *Volatile Eſſential Oil* combined with a large proportion of *Carbon.*

Exiſts in many of the fragrant plants, as *Lavender, Roſemary, Marjoram,* &c. but principally procured by diſtillation with water, from a particular ſpecies of laurel, (*Laurus Camphora Lin.*)

Requires the addition of a ſmall quantity of *Lime*, in its ſubſequent refinement by ſublimation.

White. Tranſparent. Friable. Taſte *pungent* and *bitteriſh*. Specifically lighter than *Water*.

Evaporates completely if kept expoſed to the *Air*.

Burns with a white flame, and is entirely conſumed.

Sparingly ſoluble in *Water;* but readily ſo in *Spirit of Wine* and *Æthers*, in *Unctuous* and *Eſſential Oils*.

Diſſolves both in the *Sulphuric* and *Nitric Acid*, without decompoſition; by repeated diſtillation with the latter, is converted into a peculiar *Acid*.

Chiefly employed in *Medicine*.

Of Bituminous Bodies.

Found either liquid and devoid of colour, *Naphtha;* or more or leſs liquid and of a dark colour, *Petroleum*, *Barbadoes Tar;* of a harder conſiſtence, *Maltha;* or perfectly ſolid, black, and of a compact or ſlaty texture, *Aſphaltum*, *Jet*, *Coal.*

The more liquid Bitumens by continued expoſure to *Air*, convertible into the more conſiſtent, and all yielding ſimilar products in diſtillation. In the different kinds of *Coal* there exiſts more or leſs *earthy* admixture, and often *Iron Pyrites.*

The *bituminous* bodies immiſcible with *Water* and inſoluble in *Spirit of Wine.*

Of Amber.

Nearly allied to the foregoing.

Found for the moſt part in irregular maſſes more or leſs tranſparent, and of a browniſh or yellowiſh colour.—Specific gravity from 1.055 to 1.000. Emits a peculiar odour on friction and becomes *electric.* Melts at 550 *Farenh.* Burns with a whitiſh flame. In diſtillation yields *Water*, *Empyreumatic Oil*, (*Oleum Succini* P. L.) and a concrete *Acid*, (*Sal Succini* P. L.)

Inſoluble in *Water* and nearly ſo in *Spirit of Wine*, alſo in all the acids, the *Sulphuric Acid* excepted, in the ſolutions of the *Alkalies*, and in *eſſential* and *expreſſed Oils;* but the *Balſams* diſſolve it readily.

Of the methods uſually employed for rendering *Amber* tranſparent.

Is probably of *vegetable* origin.

ORGANISED BODIES.

Form two claſſes, *Vegetable* and *Animal*, conſiſting nearly of the ſame conſtituent principles or elements, but in different proportions.

The chemical affinities of the conſtituent principles of both, influenced by the *living principle.*

Carbon, *Hydrogen* and *Oxygen* the principal conſtituent parts of *Vegetables*, as furniſhed by *Analyſis*. They alſo contain *Saline*, *Earthy* and *Metallic* matter, the latter in ſmall quantity.

Circumſtances in which *Vegetable* ſubſtances differ from *Animal.*

Vegetable Subſtances.

Their *natural* component parts and productions are, *Cork*, *Woody-fibre*, *Tan*, *Colouring Matter*,

Matter, *Extract*, *Oils*, *Reſins*, *Wax* and *Tallow*, *Camphor*, *Gum*, *Jelly*, *Gluten*, *Albumen*, *Caoutchouc*, *Starch*, *Sugar*, *Native Salts* and *Earth*.

Several of theſe already ſpoken of.

Cork,—the exterior part of the *Quercus Suber*, a ſubſtance *ſui generis*. Yields *Suberic Acid* by treatment with the *Nitric Acid*.

Woody-fibre,—that which is left after the digeſtion of ligneous matter in *Water* and *Alcohol*.

Tan,—contained in all aſtringent vegetable ſubſtances, but moſt plentifully in *Catechu* and the *Gall Nut*, from the concentrated infuſions of which it may be precipitated by *Carbonate of Potaſh* or by *Acids*. When dry is of a brown colour, brittle, of a very aſtringent taſte, very ſoluble in *Water*, and ſtill more ſo in *Alcohol*.—Forms an inſoluble compound with *Glue*, and produces a deep blue precipitate when added to the ſolution of *Oxy-ſulphate of Iron*. On diſtillation yields an *Acid Liquor*, a ſmall proportion of *Empyreumatic Oil* and about $\frac{1}{38}$ its quantity of *Charcoal*.

Colouring Matter,—that part of *Vegetable Subſtances* which is attracted by the fibres of *Silk*,

Silk, *Linen*, *Wool*, &c. in the act of dying.— Differs in its other properties according to the ſubject from which it is obtained.

Extract,—obtained from the watery infuſion of *Saffron*, and many other plants, by evaporating it to dryneſs. Diſtinguiſhable from all other vegetable ſubſtances by being ſoluble both in *Water* and in *Alcohol*, but not in *Sulphuric Æther*.

Gum,—procured moſt plentifully from certain ſpecies of *Mimoſa*. When pure, colourleſs, inſipid, ſoluble in *Water* but not in *Alcohol* or *Oils*.—Not prone to decompoſition by keeping. —Soluble in the *Vegetable Acids* without alteration, but decompoſed by the *Mineral*. 100 parts ſaid to conſiſt of 65.38 *Oxygen*, 23.08 *Carbon*, and 11.54 *Hydrogen*.—An article of the *Materia Medica*; uſeful alſo in divers manufactures, particularly in *Calico Printing*.

Jelly,—obtained from the expreſſed juice of *Currants*, and many other fruits, in the form of *Coagulum*, by allowing the juice to remain for ſome time at reſt, decanting off the thinner part, and waſhing the remainder in a ſmall quantity of water.—In this ſtate is nearly colourleſs, and of a tremulous conſiſtence.— Soluble in hot water, but again coagulates in cooling.—When dried becomes tranſparent.—Combines readily with *Alkalies*, and by the *Nitric Acid* is converted into *Oxalic.*

Gluten,—the grey coloured tenacious and inſipid ſubſtance which is left behind in waſhing the paſte of *Wheaten Flour* in repeated portions of *Water*. In its *moiſt* taſte much diſpoſed to putrify.—When dried reſembles *Glue.*—In boiling water loſes its tenacity.—Soluble in all the acids, and in ſolutions of the *Alkalies*, by the aſſiſtance of heat.—Inſoluble in *Water*, *Alcohol*, *Æthers* and *Oils*.—Differs from moſt other *Vegetable* ſubſtances, and reſembles *Animal* in containing *Azote.*

Albumen,—ſo called from its reſemblance to white of egg.—Obtained by expoſing to a boiling heat, the water employed in the preparation of *Starch* from flour, or the depurated expreſſed juice of *Scurvy-graſs*, *Creſſes*, and moſt other cruciform plants.—Separates at this temperature in the form of *Coagulated Flakes*.—Is alſo precipitated from its watery ſolutions by *Alcohol* and *Acids*.—When dried reſembles *Glue*, and is then readily ſoluble in *Alkalies*.—In diſtillation yields *Carbonate of Ammonia*, and conſequently contains *Azote.*

Caoutchouc,—the inſpiſſated milky juice of certain trees, the *Hœvea Caoutchouc*, *Iatropha Elaſtica*, and others growing chiefly in *South America*. When freſh is of an aſh colour; without taſte or ſmell.—Very elaſtic.—Sp. Gr. 0.933.—Not altered by *Air*.—Perfectly inſoluble in *Water*.—Soluble in *rectified Petroleum*.—*Volatile Oils*, and in pure *Æther*, but not in *Alcohol*.—Is decompoſed by the aſſiſtance of heat both by the *Sulphuric* and *Nitric Acids*, but not affected by *Alkalies*.—Melts readily when heated, yields *Ammonia* in diſtillation, and in the open fire burns with a white flame.

Starch,—the grey or white ſediment depoſited by *Wheaten Flour*, *Potatoes*, and various other vegetable ſubſtances, after diffuſion in water.—Has ſcarcely any ſmell, and but little taſte; though inſoluble in *cold Water*, combines with it by *boiling* into a kind of *Mucilage*.—Altogether inſoluble in *Alcohol*, and not readily acted on by *diluted Acids*; but ſoluble without decompoſition by *Alkalies*, unleſs when they are concentrated and aſſiſted by heat. By deſtructive diſtillation yields a large proportion of *Carbon*. Suppoſed to be converted into *Sugar* in the proceſs of *Malting*.

Sugar,—the produce of the *Arundo Sacchariféra* or *Sugar Cane*, *Sugar Maple*, *Beet*, *Carrot*, and many other vegetables.—When purified, of a white colour, ſweet, inodorous, not ſubject to alteration *by expoſure to Air ; very ſoluble* in water, and *crystallizable ;* ſoluble alſo in *Alcohol*, but not in ſo large a proportion.—Readily decompoſed both by the *Sulphuric* and *Nitric Acids ;* in the *weaker Acids* merely ſoluble.—Forms with *Potaſh* a bitter aſtringent compound, inſoluble in *Alcohol ;* forms a ſimilar one with *Lime*. On decompoſition by heat yields *Water*, *Carbonic Acid*, *Carbonated Hydrogen Gas*, *Empyreumatic Oil*, *Acetous Acid*, and *Charcoal*. — 100 parts conſiſt, according to *Lavoiſier*, of 64 *Oxygen*, 28 *Carbon*, and 8 *Hydrogen*.

Animal Subſtances.

Yield in general, by analyſis, more *Azote* than *Vegetables*.

Their principal conſtituent parts and productions are, *Fibrine*, *Albumen*, *Gelatine*, *Mucilage*, *Urea*, *Sugar*, *Oils*, *Reſins*, *Sulphur*, *Phoſphorus*, *Acids*, *Alkalies*, *Earths*, *Metals*.

Thoſe not already treated of are,

Fibrine,—commonly called coagulable lymph, is that which remains on waſhing the craſſamentum of blood in ſucceſſive portions of water, till it ceaſe to give out any colour. Bears a ſtrong reſemblance to muſcular fibre; is white, taſteleſs, ſoft, ductile, elaſtic, inſoluble either in *Water* or *Alcohol;* in boiling water becomes hard and inelaſtic; in its ſoft ſtate much diſpoſed to putrify; by long digeſtion in water is converted into a particular ſpecies of tallow.—Soluble in moſt of the *Acids*, and in the ſtronger ſolutions of both the *fixed Alkalies*, with which, by the aſſiſtance of heat, it forms a viſcid bitter ſoap. In diſtillation yields a large proportion of *Ammonia.*

Albumen,—contained in the ſerum of blood, and in various other animal ſubſtances; moſt abundantly in white of egg. In its moiſt and freſh ſtate is nearly without colour, taſte or ſmell—viſcid—readily ſoluble in cold water—diſtinguiſhable from other animal fluids by coagulating at a temperature of 165 *Farenh.*—*Acids* and *Alcohol* produce on it a ſimilar effect. When coagulated is inſoluble in water.—*Tan* added to its aqueous ſolution, forms with it a copious

CHEMICAL NOMENCLATURE.

IES.	—RENDERED INTO GAS BY CALORIC.	—COMBINED WITH OXYGEN.	—OXYGENATED AND GASEOUS.	—OXYGENATED WITH BASES.	—IN COMBINATION INDEPENDENTLY OF OXYGEN.
ble.	Oxygen gas. *Vital, dephlogiſticated, pure or empyreal air.*				
le air.	Hydrogen gas. *Inflammable air.*	Oxyd of Hydrogen. *Water.*			Hydrocarbonic gas. *Heavy inflammable air.* Sulphurated hydrogen gas. Phoſphorated hydrogen gas.
Baſe of *r.*	Azotic gas, Nitrogen gas. *Phlogiſticated air, Mofete.*	Nitrous oxyd. Oxyd of azote. *Baſe of nitrous air.* Nitrous acid. *Phlogiſticated or ſmoaking nitrous acid.* Nitric acid. *Dephlogiſticated or colourleſs nitrous acid.*	Gaſeous oxyd of azote. *Dephlogiſticated nitrous air.* Nitrous gas. *Nitrous air.* Nitrous acid gas. *Nitrous acid air.*	Nitrite of potaſh, &c. Nitrate of potaſh—of ſoda, &c. *Sultpetre or common nitre—cubic nitre, &c.*	Azotic hydrogen gas. *Ammoniacal air, alkaline air.*
Diamond,		Carbonic acid. *Fixed air.*	Carbonic acid gas. *Fixed air, aerial acid.*	Carbonate of lime—of potaſh, &c. *Mild or aerated calcareous earth, vegetable alkali, &c.*	
Brim-		Sulphureous acid. *Volatile or phlogiſticated vitriolic acid.* Sulphuric acid. *Acid, oil or ſpirit of vitriol.*	Sulphureous acid gas. *Vitriolic acid air.*	Sulphite of potaſh, &c. *Stahl's ſulphureous ſalt, &c.* Sulphate of potaſh. *Vitriolated tartar.* Sulphate of ſoda. *Glauber's ſalt.* Sulphate of Alumine. *Common Alum.* Sulphate of iron. *Green vitriol, &c.*	Sulphuret of potaſh—of ſoda, &c. *Alkaline hepars, Livers of ſulphur, &c.* Sulphuret of lime, &c. *Earthy hepars.* Sulphuret of iron—of lead—of antimony, &c. *Iron Pyrites—Potters lead ore, galena—common or crude antimony, &c.*
		Phoſphorous acid. *Volatile phoſphoric acid.* Phoſphoric acid *Fixed phoſphoric acid.*		Phoſphite of potaſh—of ſoda, &c. Phoſphate of potaſh—of ſoda, &c. *Phoſphorated kali, ſoda, &c.*	Phoſphuret of lime. Phoſphuret of iron, &c. *Siderite, &c.*
		Muriatic acid. *Marine acid, acid of ſea ſalt.* Oxymuriatic acid. *Dephlogiſticated marine acid.*	Muriatic acid gas. *Marine acid air.* Oxymuriatic acid gas. *Dephlogiſticated marine acid air.*	Muriate of potaſh—of ſoda, &c. *Salt of Sylvius—Common ſalt, &c.* Oxymuriate of potaſh, &c.	
		Boracic acid. *Sedative ſalt.*		Borate of potaſh—of ſoda, &c. *Vegetable borax—com. borax, &c.*	
		Fluoric acid. *Spathic acid.*	Fluoric acid gas. *Spathic acid air.*	Fluate of lime, &c. *Fluor ſpar, &c.*	
		Succinic acid. *Salt of amber.*		Succinate of potaſh, &c.	
		Acetous acid. *Vinegar, diſtilled vinegar.* Acetic acid. *Radical vinegar.*		Acetite of potaſh—of ammonia—of lead, &c. *Diuretic ſalt—Mindererus ſpirit—Sugar of lead, &c.* Acetate of potaſh.	

	SIMPLE BODIES.	—RENDERED INTO GAS BY CALORIC.	——COMBINED WITH OXYGEN.	——OXYGENATED AND GASEOUS.	——OXYGENATED WITH BASES.	——IN COMBINATION INDEPENDENTLY OF OXYGEN.
ACIDIFIABLE BASES.	Tartaric radical.		Tartareous acid. *Acid of cream of tartar.*		Tartrite of potaſh—of ſoda, &c. *Soluble tartar—Rochelle ſalt, &c.* Acidulous tartrite of potaſh. *Cryſtals or cream of tartar.*	
	Pyrotartaric radical.		Pyrotartareous acid. *Empyreumatic acid of tartar.*		Pyrotartrite of potaſh, &c.	
	Oxalic radical.		Oxalic acid. *Acid of ſugar.*		Oxalate of lime—of ſoda, &c. Acidulous oxalate of potaſh. *Salt of ſorrel.*	
	Gallic radical.		Gallic acid. *Acid of galls.*		Gallate of potaſh—of lime, &c. Gallate of iron. *Common ink.*	
	Citric radical.		Citric acid. *Acid of lemons.*		Citrate of potaſh—of lime, &c.	
	Malic radical.		Malic acid. *Acid of apples.*		Malate of potaſh, &c.	
	Benzoïc radical.		Benzoic acid. *Acid or flowers of Benjamin.*		Benzoate of lime, &c.	
	Pyrolignic radical.		Pyroligneous acid. *Acid of birch and other woods, and of tar.*		Pyrolignite of potaſh—of iron, &c.	
	Pyromucic radical.		Pyro-mucous acid. *Spirit of honey of ſugar, &c.*		Pyromucite of magneſia— Ammoniacal pyromucite, &c.	
	Camphoric radical.		Camphoric acid. *Acid of camphor.*		Camphorate of potaſh, &c.	
	Lactic radical.		Lactic acid. *Acid of milk.*		Lactate of potaſh, &c.	
	Saccholactic radical.		Saccholactic acid. *Acid of ſugar of milk.*		Saccholate of lime, &c.	
	Formic radical.		Formic acid. *Acid of ants.*		Formate of ammonia, &c.	
	Pruſſic radical.		Pruſſic acid. *Acid or colouring matter of Pruſſian blue.*		Pruſſiate of potaſh—of iron, &c. *Pruſſian or phlogiſticated alkali—Pruſſian blue, &c.*	
	Sebacic radical.		Sebacic acid. *Acid of fat.*		Sebate of ſoda—of lime, &c.	
	Uric radical.		Uric acid. *Lithic acid.* *Acid of urinary calculus.*		Urate of ſoda, &c.	
	Bombic radical.		Bombic acid. *Acid of ſilkworms.*		Bombiate of iron, &c.	
	Zoonic radical.		Zoonic acid.		Zoonates of potaſh, &c.	
	Suberic radical.		Suberic acid. *Acid of cork.*		Suberate of potaſh, &c.	

ETALS.

SIMPLE BODIES.	—RENDERED INTO GAS BY CALORIC.	——COMBINED WITH OXYGEN.	——OXYDATED AND WITH BASES.	——OXYGENATED AND WITH BASES.	——IN COMBINATION INDEPENDENTLY OF OXYGEN.
Arſenic. *Regulus of arſenic.*		Oxyd of arſenic. *White arſenic, arſenious acid.* Arſenic acid.	Sulphurated oxyd of arſenic, yellow and red. *Orpiment,* *Realgar.* Alkaline oxyd of arſenic. *Liver of arſenic.*	Arſeniate of potaſh, &c. *Arſenical ſalt of Macquer.*	Alloy of arſenic and tin, &c.
Tungſten. *Regulus of tungſten Scheele.*		Oxyd of tungſten. *Yellow calx of tungsten.* Tungſtic acid.		Tungſtate of lime, &c. *Lapis ponderoſus.* Tungſtate of iron, with manganeſe, &c. *Wolfram.*	Alloy, &c.
Molybdena. *Regulus of molybdena.*		Oxyd of molybdena. *Calx of molybdena.* Molybdic acid.	Sulphurated oxyd of molybdena. *Molybdena.*	Molybdate of potaſh—of lead, &c.	Alloy, &c.
Chrome.		Oxyd of chrome. Acid of chrome.		Chromate of potaſh—of lead, &c. *Red lead ore of Siberia.*	Alloy, &c.
Titanite. *Metal of menachanite.*		Oxyd of titanite.	Alkaline oxyd of titanite.		Alloy, &c.
Uranite. *Regulus of uranite.*		Oxyd of uranite. *Yellow calx of uranite.*			Sulphuret of uranite, &c. *Pechblende.*
Cobalt.		Oxyds of cobalt of different colours. *Calces of cobalt.*	Alkaline cobaltic oxyds. *Precipitates of cobalt re-diſſolved by alkalis.*		Alloyed with arſenic. *Grey cobalt ore.*
Nickel.		Oxyd of nickel. *Calx of nickel.*			Alloyed with iron, &c.
Manganeſe. *Regulus of manganeſe.*		Oxyds of manganeſe of different colours. *Calces of manganeſe.*	Alkaline oxyd of manganeſe. *Mineral cameleon.*		Alloyed with iron, &c.
Biſmuth.		Oxyds of Biſmuth—yellow—white—vitreous. *Yellow calx of biſmuth—magiſtery of biſmuth.* *Spaniſh white.*	Alkaline oxyd of biſmuth.		Alloyed with tin. Sulphuret of biſmuth.
Antimony. *Regulus of antimony.* *Stibium.*		Oxyds of antimony, 1. by nitric acid. *Diaphoretic antimony.* 2. by muriatic acid. *Powder of algaroth.* 3. by ſublimation. *Argentine flowers.* 4. by vitrification. *Glaſs of antimony.*	Alkaline oxyds of antimony. *Livers of antimony.* Hydroſulphurated oxyds of antimony. *Kermes mineral—Golden ſulphur of antimony.*		Alloyed with lead, &c. *Printer's types, &c.* Sulphuret of antimony. *Crude antimony.*
Tellurium. *Sylvanite.*		Oxyd of tellurium.			Alloyed with gold, ſilver, &c. *White and grey gold ores.*
Zinc. *Spelter.*		Oxyds of zinc. *Calx of zinc, flowers of zinc.* *Lapis calaminaris, &c.*	Sulphurated oxyd of zinc. *Precipitate of zinc by liver of ſulphur, blende.*		Alloyed with copper, &c. *Braſs, &c.*

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	SIMPLE BODIES.	—RENDERED INTO GAS BY CALORIC.	——COMBINED WITH OXYGEN.	——OXYDATED AND WITH BASES.	——OXYGENATED AND WITH BASES.	—— IN COMBINATION INDEPENDENTLY OF OXYGEN.
METALS.	Tin. *Jupiter.*		Oxyds of tin, grey and white. *Calx of tin—Flowers of tin, &c.*	Sulphurated oxyd of tin, black and yellow. *Aurum muſivum.*		Alloyed with lead, biſmuth, &c *Pewter, ſoft ſolder, &c.*
	Lead. *Saturnus.*		Oxyds of lead of different colours. *White lead, Ceruſſe—Litharge—Red lead, minium, &c.*	Sulphurated oxyd of lead. *Sulphurated calx of lead.*		Alloyed with tin, &c. Sulphuret of lead. *Galena, Potters lead ore.*
	Iron. *Mars.*		Oxyds of iron of different colours. *Martial Æthiops—Ochre—Colcothar, &c.*	Sulphurated oxyd of iron. *Sulphurated calx of iron.*		Alloyed with arſenic, &c. *Red ſhort iron, &c.* Carburet of iron. *Steel.* Phoſphuret of iron. *Cold ſhort iron, Siderite.* Sulphuret of iron. *Iron pyrites.*
	Copper. *Venus.*		Oxyds of copper brown and red. *Calces of copper.*	Ammoniacal oxyd of copper. *Cuprum ammoniacum.*		Alloyed with zinc, &c. *Braſs, &c.* Sulphuret of copper. *Copper pyrites.*
	Quickſilver. *Mercury.*		Oxyds of quickſilver. 1ſt. Black. *Æthiops per ſe.* 2d. Grey. 3d. White. *White precipitate.* 4th. Yellow. *Turpeth mineral.* 5th. Red. *Red precipitate.* *Calcined quickſilver.*	Sulphurated oxyd of quickſilver, black and red. *Æthiops mineral. Cinnabar.*		Amalgamated with gold, &c.
	Silver. *Luna.*		Oxyd of ſilver. *Calx of ſilver.*	Ammoniacal oxyd of ſilver. *Argentum fulminans.*		Alloyed with copper, &c.
	Gold. *Sol*		Oxyd of gold. *Calx of gold.*	Ammoniacal oxyd of gold. *Aurum fulminans.*		Alloyed with ſilver, copper, &c.
	Platina. *White gold.*		Oxyd of platina. *Calx of platina.*			Alloyed with copper, &c.

EARTHS AND ALKALIS.

Silex. *Vitrifiable or flinty earth, quartz.*	Alumine. *Argillaceous earth, clay.*	Baryt. *Ponderous earth.*	Strontian. *Earth of ſtrontianite.*	Lime. *Calcareous earth.*	Magneſia. *Muriatic earth.*	Zircon. *Jargon earth.*	Glucine.	Yttria.	Aguſtine.	Potaſh. *Vegetable alkali.*	Soda. *Mineral alkali, natron.*

COMPOUND VEGETABLE AND ANIMAL CONSTITUENT PARTS AND PRODUCTIONS.

Mucus.	Gum.	Gluten.	Sugar.	Starch.	Fixed oils. *Fat or unctuous oils*	Volatile oils. *Eſſential oils.*	Aroma. *Spiritus rector.*	Reſin.	Camphor.	Waxy matter.	Tannin. *Aſtringent principle.*
Extractive matter.	Fecule. *Sediment.*	Woody matter.	Alcohol.	Æther.	Serum.	Lymph.	Albumen.	Gelatin. *Animal gluten.*	Fibrin. *Animal fibre.*	Cheeſy matter.	Oſſific matter.

copious yellow coloured tenaceous precipitate, which, when dried, is brittle, and not ſuſceptible of putrefaction.—*Albumen* ſoluble in *Alkalies* and *Alkaline Earths.* — In diſtillation yields the ſame products as *Fibrine*, but with a leſs proportion of *Ammonia*.

Gelatine,—or Jelly, obtained by boiling certain animal ſubſtances, particularly ſkin, in common water, evaporating the decoction to the neceſſary degree of conſiſtence, and allowing it to cool.—When pure, tranſparent and colourleſs. Soluble both in cold and hot water, very readily in the later, even at a temperature of 90 *Farenh.*—By drying becomes ſemi tranſparent, hard, brittle, and of a vitreous fracture, *Glue.*—Is inſoluble in *Alcohol*; *Alkalies* require the aſſiſtance of heat, but *Acids* diſſolve it with great facility, even when diluted.—With *Tan* it forms, like *Albumen*, a yellowiſh coloured plaſtic compound, inſoluble in water, and not ſuſceptible of putrefaction; hence the theory of *Tanning*.—Heat decompoſes it like other animal ſubſtances.

Urea,—procured from freſh *Urine* in the form of ſmall cryſtalline plates, by evaporating it to the conſiſtence of ſyrup, digeſting this when cold in *Alcohol*, diſtilling the ſolution ſo as to ſeparate and collect the ſpirit, and allowing the reſiduum to cryſtalliſe by cooling. Thus obtained, its colour is *yellowiſh white*, ſmell *alliaceous*, taſte *ſtrong* and *ammoniacal*, conſiſtence *viſcid*, extremely ſoluble in *Water*, ſomewhat leſs ſo in *Alcohol*, ſoluble alſo in the aqueous ſolutions of both the *Fixed Alkalies* and in *Marine Acid*.—By the *Sulphuric* and *Nitric Acids* it is decompoſed, as it is likewiſe very eaſily by expoſure to *heat*, even to that of boiling water. According to *Vauquelin*, 100 parts yield in diſtillation 92.02 *Carbonate* of *Ammonia*, 4.60 *Carbonated Hydrogen Gas*, and 3.22 *Charcoal*.

The term *Mucilage*, given to thoſe animal ſubſtances which are ſoluble in *Water*, but not in *Alcohol*; are not coagulable by *Heat* nor form a jelly by evaporation, and do not afford a precipitate on the addition of *Tan*.

THE END.

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